The Electric Vehicle Question

by

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Imagine driving a car and never having to go to the gas station. A car that ran so quietly you would doubt that it was even running. One that you could leave running in your garage without having to worry about the need for proper ventilation or any pungent and harmful fumes entering into your home. These are but a few of the possibilities that electric vehicles make a reality. Now, we just need to persuade the automakers to begin mass producing these vehicles for the marketplace so that we may begin to reap these benefits.

California, New York and several other states currently have in place regulations that require the top seven retailers of automobiles in each perspective state to sell zero emission vehicles as a percentage of all vehicles sold in the forthcoming vehicle model years. Electric vehicles are the only currently approved zero emission vehicles that are available in the marketplace today. The feasibility of manufacturing and marketability of these vehicles at an affordable price to consumers and at a profit to automakers remains a question.

In New York, these regulations or mandates require that, starting with the 1998 model year. Each of the top seven automakers new vehicle sales fleet of cars and light-duty trucks that have a gross vehicle weight of less than 3750 pounds must be comprised of at least 2% zero-emission vehicles. That number rises to 5% for model year 2001 and then again to 10% for model year 2003. If these numbers are not met by the end of the respective model year, the automakers can still avoid paying any penalties by selling enough vehicles in the following year to cover the past year sales volume shortfall. After

this point, there is a penalty of approximately $25,000 per vehicle sale short of the minimum number of vehicles required to be sold in the respective model year.

California and Massachusetts also had similar regulations until recently. California has been the leader in vehicle emission control requirements followed closely by New York and Massachusetts. However, under heavy lobbying from the automakers, California recently relaxed its regulations so that the automakers only had to meet the 10% mandate for model year 2003. Except for a few side deals that were made with the automakers requiring a set number of electric vehicles to be sold each year, to show that they were making progress towards the 10% goal for model year 2003, the automakers could phase electric vehicles into their sales fleets at their own pace or pay fines for not reaching the prearranged goal. Massachusetts followed California's lead, except for the side deal; but New York has decided to fight the automakers in the United States Federal Court system over the right to require the automakers to offer electric vehicles for sale in New York. The results of the automakers appeal will be decided any day now and will certainly be appealed by the losing party; whomever it may be.

The automakers claim that the currently available technology will not allow them to manufacture vehicles that will be reasonably priced, that will meet people's basic needs or that will be desired by any consumers. They demand more time to create and enhance the infrastructure within their industry in order to be able to produce even the minimum number of vehicles currently required by the regulations. They claim that the emissions from gasoline-powered vehicles have been reduced so much that there will be little gain from switching to electric powered vehicles due to the emissions created during the

production of electricity. They also warn taxpayers that they will be picking up part of the tab for these vehicles through state subsidies that offset the high costs of these vehicles in order to make them somewhat affordable to consumers. Recent advertisements proclaiming these and other reasons for not requiring automakers to manufacture electric vehicles have been paid for by large oil companies.

There are some very good points brought up by the automakers against being able to meet the required sales volumes. Being only a couple of months away from the arrival of the 1998 model year sales fleets, the automakers have yet to market electric vehicles outside of the southwestern United States, namely California. The sales requirements for the 1998 model year would be approximately 7500 vehicles for New York and 5500 vehicles for California. For automakers who have been spending their time and money fighting the regulations in court as opposed to investing in the required infrastructure required to manufacture electric vehicles, there are limited resources available to meet this rather short remaining timetable. However, many of the concerns the automakers voice in this area have been sufficiently addressed and make these numbers attainable.

The design of electric vehicles has changed in recent years along with the design of newer vehicles. The first electric vehicles consisted of simple conversions of gas-powered vehicles while newer vehicles consist of totally new designs from the ground-up and gas-powered vehicles that have manufacturer predesigned conversion kits that they can drop-in in place of gas engines on their assembly lines. These newer vehicle designs have distinct advantages over their predecessors that make today's electric vehicles even more practical than they have been in even recent years.

Newer vehicles tend to be lighter and more aerodynamic each year. These are important factors in electric vehicle design because the reduced weight of a vehicle and reduced drag or air friction have a large impact on how much energy must be expended to get a car moving and keep it moving down the road for any particular distance traveled. The vehicles on the market today require far less energy to operate than even those of just a couple of years ago. The vehicles designed from the ground-up with the intention of being manufactured as electric vehicles weigh far less than their gas powered counterparts due mostly to the lack of need for a heavy chassis that has to support a gas engine and its required adjacent components such as a radiator. GM's new EV1 is an example of a vehicle designed from the ground-up, while Toyota's RAV4 EV and the soon to be marketed Ford Ranger EV are examples of vehicles that can be supplied with either an electric-powered or gas-powered engine. The EV1 and RAV4 EV are currently available in California.

Gas-powered engines differ from electric engines in three distinct ways. They are much larger and heavier than a comparable electric engine. This comes from the requirement of gas engines to have radiators to cool them so that they don't overheat and oil to lubricate them so that the mechanical parts don't grind together. They are not as efficient as electric engines at using the energy that they produce. These engines produce heat when they run and the majority of that heat is lost driving down efficiency because energy comes from heat transfer and efficiency from the percentage of the heat transfer that is used by the engine. Gas engines efficiencies rate around 25% while electric engine efficiencies rate around 75%. The main reason is that electric engines run at ambient

temperatures and have very little heat transfer rates; because they are not converting a fuel to produce the energy that they require to operate. Lastly, because gas engines burn a fuel to produce the energy that they require, they tend to give off pollutants into the environment, such as carbon monoxide and carbon dioxide, unlike electric engines that run off of electricity.

Automakers and oil producers argue that much of today's electricity still comes from the conversion of fossil fuels, which is quite true. However, fossil fuels are projected to run out in the foreseeable future and there are many alternate sources for producing electricity such as hydroelectric dams, solar power and, currently, nuclear reactors (fission reactors) with the hope of fusion reactors in the foreseeable future. Also, stationary sources of emissions such as power plants are easier to monitor than moving sources such as motor vehicles. With motor vehicles on the roads in ever increasing numbers and the lower emissions of electric vehicles, the emissions from the burning of fossil fuels, such as gasoline, can still be greatly reduced.

One of the main questions regarding the efficiency of electric vehicles has to do with the battery packs that are used to power the vehicles. In the past, lead-acid battery packs have been used because they were the only ones available; but, they tend to be very heavy, take up a lot of space, lose their charge quickly and have a short life span, about two years. Also, these batteries pose another environmental problem, the disposal of all the used up lead and contaminated casings. For automakers, another concern with lead-acid batteries is that they do not perform well in either very hot or especially very cold climates. These climates can cause them to lose their charge up to 80% faster than they

would under normal conditions. The cold climate performance has been the main argument for not being able to sell electric vehicles in the northeastern region of the United States. However, in the last couple of years, new developments in battery technology have led to the introduction of lithium-ion batteries and nickel-metal-hydride batteries, which not only outperform lead-acid batteries but are environmentally safer than the traditional lead-acid batteries.

Nickel-metal-hydride (NiMH) batteries show the great potential in improving the performance of even currently designed electric vehicles. These batteries are lighter and can hold more electricity than traditional lead-acid batteries; which means that less energy is required to propel the vehicle and more energy is available to extend the distance traveled by the vehicle. They can be charged up to 80% capacity, recommended charging capacity for beginning most drives, within 15 minutes with a super-charger as opposed to 8-12 hours. Many of these chargers run on standard 110V or 220V current. The expected lifespan of a NiMH battery is around 5 years in most vehicles with normal use. Vehicles equipped with these batteries are expected, according to the automakers, to double their current driving distances between required charges. On top of all these benefits, NiMH batteries also perform very well in both hot and cold climates. When tested in Vermont at ambient temperatures of 0° F, the batteries showed less than a 20% drop in performance, far superior to the performance of lead-acid batteries.

As an example of the performance of NiMH batteries over that of lead-acid batteries, one can look at GM's coveted EV1 which is currently being marketed through

GM's Saturn dealerships, but only in the southwestern United States. Currently, the expected driving range of the EV1 is between 70 and 90 miles under typical automobile usage; meaning even highway driving speeds of 65 mph. Replacing the lead-acid batteries with NiMH batteries, the driving range improves to approximately 150 miles under normal driving conditions, according to GM. The land-speed records for electric vehicles are, separately, distance traveled on a single charge of well over 300 miles and top speed of well over 100 mph, note that this is a speed well above the legal speed limit of most states in this country.

This brings us now to a rather interesting topic, marketability. First and foremost, are there any consumers in the marketplace for even the 2% required sales volume? The answer, believe it or not, is Yes! Many, many surveys have been done over the last several years to study the available market for electric vehicles, and all of these survey's indicated, for a vehicle that could only give them 50 miles of driving per day, that at least 5% of consumers would be happy with an electric vehicle. Interest soared to over 50% when consumers were asked about a vehicle that could be driven 100 miles per day. This still leaves the question, at what price?

The price of most electric vehicles available for sale today is around $35,000, about the starting cost of a luxury automobile. This may seem a bit high, but; if one considers the that this a relatively new product in the marketplace with very little competition, one can see that the price will decrease over the next few years through that economic phenomenon known as economies of scale. As an example, again, GM recently announced a price cut in the price of it's EV1 from around $38,000 to around $33,000

when Toyota and Honda started to market their electric vehicles in California for around $33,000. Also, the states that require electric vehicles to be sold in their states provide economic incentives to consumers. These incentives help to cover the cost of an electric vehicle above the cost of an average vehicle. Some of these incentives are partial payments of monthly lease payments by the state, tax credits of as much as $5,000 for purchasing an electric vehicle, and freedom from paying sales tax on the purchase of an electric vehicle.

Automakers may argue that the states involved are putting an undo burden on their taxpayers, but they have also benefited from government requirements and incentives. The big three automakers have received over $300,000,000 worth of aid from the US government at taxpayers expense to help fund the research and development of electric vehicles for sale in the US in the last 5 years alone. The US government and several other state governments has also funded numerous other programs that directly benefit automakers at an impossible to track cost to taxpayers. Programs ranging from new battery technology to development of vehicles that can travel 100 miles on a gallon of gas. This latter program has seen countless millions spent over several years with only a modest increase in gas mileage for vehicles in the last ten years and no significant increase expected any time soon from a program that is now in need of additional funding.

This brings us back to the question of whether or not to persuade the automakers to mass produce electric vehicles for the marketplace so that we may begin to reap their benefits today. Should we let the automakers decide when we the consumers are ready for electric vehicles that will cost us around $2/day to charge or should we dictate through

our government when we want electric vehicles to be available and affordable? Are we to trust the automakers, who happen to be in business to make money, or do we force them to start producing a product that will not make them any money for several years? Automotive companies are just coming off a year in which they recorded record earnings on profits of as much as $10,000 per vehicle (Chrysler Minivan)? What about the questionable funding of the anti-electric vehicle campaigns paid for not only by the automakers, but by the large oil conglomerates in the US (as seen in attached article)?

Electric vehicle technology is here today. The automakers know it and we know it. It is no longer a question of can we produce and market electric vehicles on the part of the automakers, but when will we produce and market electric vehicles? Automakers are almost forcing themselves to have to produce and market electric vehicles or stand by and watch as some select automakers tap into and establish themselves in a future market segment that could not only become a profitable venture but that could also serve as a tool to market their other products and better their individual companies image and further increase their profits. GM, Toyota, Honda and some small scale manufacturers are already in the electric vehicle marketplace with Ford and Nissan entering by early 1998; others are bound to follow in their steps.

Now, if we could only get the automakers to bring them to the northeast, we too would be able to stop imagining.