Thursday, September 9, 2010

Mobile Energy: As I mentioned yesterday, the greater challenge for energy policy going forward is in mobile source energy, meaning planes, trains, and automobiles. This is where the most urgent economic and foreign policy need arises, but where the technological barriers are also the most severe.

Weaning ourselves from foreign oil is an objective shared by almost everyone, albeit for different reasons. Some want to stop sending trillions of dollars to countries who don't like us or our way of life. Some decry the economic harm caused by our trade deficit, of which oil imports are a major part. Others want to see those energy jobs here and not in Saudi Arabia or Indonesia. And, still others want to find less polluting alternatives. All of these are valid points. So, let's just stipulate that eliminating American imports of oil sourced from outside North America is a worthy goal.

So how do we use our oil? Less than 1% of oil is used to produce electrical energy. About 30% is used in industrial processes, such as the making of plastics. That is obviously a significant amount. It is beyond the scope of this piece to get into detail about that, but suffice it to say that alternatives to oil in non-energy producing industries could make a huge dent in our oil imports. The rest of our oil is used in transportation. Planes and trains use some, but obviously the lion's share of that transportation use is in cars and trucks. So, let's focus on them.

As most regular readers of this missive know, I spent 25 years in the retail car business before I lost my mind and went into politics. Even before that, my father, himself a committed car guy, raised me as a motorhead. I have vivid memories of his 1957 Thunderbird, his '63 Chevrolet Corvair supercharged by Andy Granitelli, and his stories about how he drove a brand new 1936 Cord across the country (and how that car was way ahead of its time). Since then, I have made cars my hobby, and have a small collection of classic cars, including a 1936 Cord and a 1957 Thunderbird. No Corvair, however.

Anyway, I digress. The point is that a lot of misinformation has been spread around as people make predictions or definitive statements on a subject about which they know little about. I am not the world's greatest authority on the subject of cars and propulsion systems, but I probably know more than anyone in Congress and more than most people.

These days, there is lots of talk about electric cars, hybrids, and plug-in hybrids, along with all kinds of different fuels that might be used in cars. Some people want personal transportation (cars) to go away entirely. Others think we are headed to all electrics, or all hybrids. Most cars in Europe run on diesel and most in Brazil on ethanol. And then there are fuel cells. And, of course, there are 130 million cars and trucks in the US today which, almost entirely, are powered by gasoline. This is important stuff since it is wrapped up in energy independence, global warming, smog, personal freedom, tax policy, and just about everything else you can imagine. What should US policy on cars, and the energy used to power them, follow? Is there a future for electric cars or is there something else? What are the practical alternatives and where might all these ideas go?

Here is my analysis:

Electrics: An electric motor has a bunch of advantages over the Internal Combustion Engines (ICEs) in cars today. They are smaller, lighter, very fast, do not need a transmission, and they do not get hot or need external cooling like an ICE. So why don't all cars have them now? The problem is not with the motor, but in how to get electric power to the motor. The only way we know of now is to store power onboard through a battery. And despite billions of dollars in research over the last 20 years and an enormous potential market, no breakthroughs in battery technology have occurred. The same 3 types of battery technologies which existed in the 80s are what we have today, and they are only marginally cheaper and marginally higher performing. As a result, pure battery-powered electrics (like the Tesla) suffer from high cost ($109,000 in the case of the Tesla) and limited range, particularly in cold climates (batteries hold less energy when cold, but the car uses more). They are also quite heavy and weight is the enemy of fuel economy and efficiency in any car. Therefore, there will be a few more pure electrics introduced to the market in the next few years, but they will continue to have very limited volume without a breakthrough in battery technology.

So, the next best thing is to produce some of that electric power on board. The "environmentally cleanest" way to do that is with a hydrogen powered fuel cell on board. But this technology has problems as well. It is very, very expensive in a mobile application. You also have to either store hydrogen on board or produce it on board from something else. Storing it is a problem because gaseous hydrogen takes up a lot of space and is explosive (does the Hindenberg come to mind?). In liquid form it must be kept very, very cold and will boil out over time even at 0 degrees centigrade. You can produce it from water, but that is very expensive and takes energy to do. The most practical fuel cell cars will probably produce the hydrogen from gasoline or natural gas, although then some emissions will occur. No car manufacturer is planning a production fuel cell car, although most have multi-million dollar

prototypes running around.

So, the most practical way to produce electricity on board is to have a gasoline-powered generator in the vehicle. When you hear the term "plug-in hybrid", this is what they are talking about. This is a car powered by an electric motor that has a separate ICE onboard that acts as a generator to recharge the battery when it gets low. The plug-in part means that you can charge the battery by plugging it in at home. But, to keep the cost down, a plug-in hybrid has only enough heavy, expensive batteries to power it for a few miles until the generator kicks in. And, since the ICE is just a generator, it can operate at a constant RPM and be made considerably more efficient than an ICE that drives the wheels. The first commercially available plug-in hybrid will be the Chevrolet Volt, which will come out in select markets later this year. Over the next few years, a number of other manufacturers will sell plug-in electrics in limited models. These include big names like Nissan, Toyota, and Mercedes; as well, as the new upstarts like Fisker and Tesla.

Plug-in hybrids have the most potential of all electric powered vehicles in the next decade or so. They are still expensive and heavy, but not as expensive or heavy as a pure electric - depending on just how big a battery pack each manufacturer chooses to put in the car. And, they have potentially unlimited range as you can keep running the generator to keep the car going. But, they use gasoline, albeit much less than a pure ICE car particularly on short trips where a plug-in is available. You could power the generator with another fuel, but that requires a new infrastructure and all of that adds cost to an already expensive technology.

So, plug-in hybrids will be coming to a car dealership near you. Whether they succeed in becoming more than a tiny segment of the market will depend on your willingness to spend extra money to get one, how reliable the technology is, and if the manufacturers can figure out how to make money on them. Each has been a challenge with the hybrids that are out there today. In any event, they will need gasoline to operate.

Traditional Hybrids: These are cars with which we are all familiar, like the Toyota Prius and the Ford Escape or Fusion. I believe that in the future these will be seen to have been a short–term, stop-gap technology that will not be long lasting. They have many of the cost disadvantages of a plug-in hybrid (two powerplants, expensive batteries, etc) with much smaller fuel economy benefits. In fact, standard diesels will provide equal or better fuel economy than a traditional hybrid at substantially less cost. Every manufacturer has some of these now. They were all unprofitable for the manufacturers (Toyota has never made money on Prius in the past and, in fact, considered the loss on each car as a “marketing” expense), but now manufacturers are sharing each other’s technology and the costs are coming down. Still, it is

hard to justify the price premium on one of these cars by using the fuel savings, and most buyers simply are willing to pay more for the hybrid image. But, those image buyers are limited, and I believe that plug-in hybrids will eventually replace these traditional hybrids in the marketplace.

So what about alternative fuels?

More on that next week.

I remain respectfully,

Congressman John Campbell
Member of Congress