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The Promise of Electric Vehicles

The Problem – The Oil Monopoly in Transportation

We have arrived today as a nation at a place where we are no longer in control of our own destiny. Due to a convergence of geopolitical, macroeconomic, natural resource and environmental issues, we find ourselves overwhelmingly dependent on a dwindling economic resource which is controlled by largely inimical foreign actors and the competition for which is increasing at a radical and accelerating rate. Oil, the natural resource upon which the growth and strength of our national economy and our global dominance was built is now the source of our greatest vulnerability from the perspective of both national and economic security.

The facts are plain. Where once we were a surplus producer of oil, we have since the 1970ôs, become a net importer wherein the delta between our domestic supplies and domestic demand is continuing to grow. More broadly, most projections for the known attainable global supply of this resource suggest that we are at or near the historical peak of discovery and production. All of this at a time when literally billions of new consumers are emerging out of poverty in China, India and other parts of the developing world to demand the basics of a modern middle class lifestyle ï the universal totem of which is the automobile. Competition for this increasingly scarce resource is accelerating at an alarming pace and while that competition has thus far expressed itself in largely economic terms, there is every expectation that that competition will increasingly manifest itself in kinetic and mortal terms - if it hasnôt already. Our national economy is subject to the wild swings and volatility of oil prices as experienced in the oil shocks of the 70ôs, the price spikes of 2008 and today - even as a fragile economic recovery from an historic recession is clawing for life. And this is to say nothing of the environmental effects that attend the proliferation of internal combustion of oil and gasoline in the tens of millions of new cars that hit the road every year and in the risks attendant in the exploration and production of oil in increasingly remote and challenging venues.

To say that we do not have a strategic problem is to bury oneôs head in the sand and deny basic realities and plain facts. And while one might argue (as some do) that policies such as the increase of domestic production (ïDrill Baby Drillô) can improve the basic equation of supply and demand in the short run, such measures are pitifully marginal in the global scheme of supply and demand of a global commodity and even in the best case scenario simply kick the can down the road for our children to address ï the same children who if we are not proactive and responsible will in the best case live lives of diminished economic opportunity and lifestyle and in the worst case will be issued a gun to go compete for this resource in the far and hostile reaches of the world.

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The Opportunity – Electric Vehicles

Against all of this doom and gloom, there is (as always) a sound, analytical and strategic fashion in which this problem can be approached and redressed. In the U.S, over 70% of all oil consumption takes place in the transportation sector. Moreover, within that sector, more than half of that oil is consumed as gasoline (or like derivatives) in passenger cars and light trucks. A sound strategic approach thus focuses on this sector as the point for greatest leverage, i.e. if you can radically reduce oil consumption in this class of vehicles, you will have the greatest catalytic and accelerative effect. Moreover, there are a host of potential alternatives the gasoline internal combustion engine (ICE), including, ethanol, biofuels, fuel cells, hybridized drive trains and so-called ñclean diesel technologies. However, the hands-down winner among all of these based on a matrixing of cost, mechanical efficiency, emissions reduction and overall capability is the battery powered electric vehicle (ñEVò or ñBEVò).

EVôs are not new technology, per se. There was a time at the advent of the automobile where there were nearly as many EVôs on the road as ICEôs. EVôs have many advantages, At the engine/motor level, EVôs are as much as 4X as efficient as ICEôs due in no small part to the radical reduction of moving parts - EV motors have one part ï the result of which is that there is less friction heat (waste) loss and thus more than 4X of the source energy is delivered as mechanical energy to turn the wheels. EVôs burn ZERO oil as they operate and even in the worst electrical generations scenario ï i.e. if you plug them into the dirtiest sector of the national grid, they produce the lowest emissions per mile travelled. Moreover, distribution of electricity is pervasive and ubiquitous ï even more so than gasoline stations ï where an EV, properly engineered, can be easily and charged in the home environment, thus obviating the need for massive infrastructure investment by either public or private entities. In fact, with the torque profile of an electric motor, it is even arguable that one can make a better more exciting automobile based on an EV powertrain.

The one factor that has held back the meaningful market penetration of EVôs has been the limitations of battery technology to produce a vehicle capable of long range driving and/or rapid refueling. Happily, there have been radical improvements in this sector in recent years. Owing to the global demand for mobile rechargeable electronic devices such cell phones, lap tops and video devices, new classes and chemistries of battery technology have emerged such as the family of lithium ion technologies. These batteries have radically improved our ability to store large quantities of electrical energy for long periods of time.

Tesla Motors has been the pioneer in transitioning these new battery chemistries and form factors to the automotive industry. We are commercializing our technology advances by pursuing the proven technology introduction model that has led to the widespread commercialization of airline travel, lap tops, cell phones, air bags and anti-lock brakes, wherein first generation technology is introduced at high price points and in limited quantities and consumed by early adopters thereby permitting the iteration and cost and capability improvement the technology and applying economies of scale to achieve lower price points and higher volumes. We firmly believe that we are setting the table for the mass adoption of a new generation of EVs. Our mission is to catalyze the development of a mass market for electric vehicles and to do so as rapidly as possible.

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Creating an EV Mass Market – Tesla Motors the Technology Leader and Market Catalyst

Tesla Motors designs, develops, manufactures and sells high-performance fully electric vehicles and advanced electric vehicle powertrain components. We have intentionally departed from the traditional automotive industry model by both exclusively focusing on electric powertrain technology and owning our vehicle sales and service network. We were the first company to commercially produce a federally-compliant highway-capable electric vehicle, the Tesla Roadster, which combines a market-leading range on a single charge (245 miles) with attractive design, driving performance and zero tailpipe emissions.

Introducing the Tesla Roadster required us to develop a proprietary electric powertrain that incorporates four key componentsð an advanced battery pack, power electronics module, high-efficiency motor and extensive control software. We believe the core intellectual property contained within our electric powertrain will form the foundation for our planned future vehicles. Since our team combines the innovation and speed to market characteristics of Silicon Valley firms with the experience of leading automotive companies, we believe that we will be able to rapidly and cost effectively introduce additional vehicles, such as our planned Tesla Model S sedan, and stay at the forefront of the electric automobile industry.

We operate in a fundamentally different manner and structure than traditional automobile manufacturers to pursue what we believe is a historic opportunityð to create an integrated company which successfully commercializes electric vehicles without compromising on range, performance or styling. In addition to designing and manufacturing our vehicles, we sell and service them through our own sales and service network. This is different from the incumbent automobile companies in the United States who typically franchise their sales and service. We believe our approach will enable us to operate more cost effectively, provide a better experience for our customers and incorporate customer feedback more quickly into our product development and manufacturing processes. We are continuing to expand our distribution network globally and as of May 1st, 2011, operated 18 Tesla stores in North America, Europe and Asia.

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First Generation Vehicle – Tesla Roadster

The Tesla Roadster, our first vehicle, showcases our technology and illustrates our leadership in electric vehicle innovation. Introduced in 2008, the Tesla Roadster can accelerate from zero to 60 miles per hour in 3.7 seconds and produces zero tailpipe emissions. The Tesla Roadster has a battery pack capable of storing approximately 53 kilowatt-hours (kWh) of usable energy, almost double the energy of any other commercially available electric vehicle battery pack. The Tesla Roadster has a range of 245 miles on a single charge, as determined using the United States Environmental Protection Agencyôs, combined two-cycle city/highway test. The Tesla Roadster reportedly set a new world distance record of 313 miles on a single charge for a production electric car in a rally across Australia as part of the 2009 Global Green Challenge. To date, our customers have driven their Tesla Roadsters an estimated aggregate of over 10 million miles. With the active cooperation of our customers we are collecting the data and associated learning from these vehicles miles driven to improve and optimize our new powertrain components and vehicles.

The Company will continue to introduce its cars and powertrain components to an ever-growing pool of consumers, ensuring both the sustained growth of the company and the growth in the total number of electric miles driven worldwide. Tesla Motorsôstrategy to enter at the high end of the automobile market has demonstrated the viability of its technology, catalyzed the automotive industry, and excited American consumers about the vast potential for advanced technology vehicles. In fact, the Tesla Roadster was named the second best invention of 2008 by *Time Magazine*. Bob Lutz, the Vice chairman of General Motors, confirmed Teslaôs success in an interview with *Newsweek*, saying *"If some Silicon Valley start-up can solve this equation, no one is going to tell me anymore that it's [the production of an electric automobile] unfeasible."* As a result of Teslaôs accomplishments, General Motors has introduced the Chevy Volt, a hybrid-electric vehicle, in 2010.

In July 2009, less than one year after the date of the commercial introduction of the Tesla Roadster, we introduced a new Roadster model, the Tesla Roadster 2, with improved electric powertrain performance and interior styling, and lower

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production costs. At the same time we introduced the Roadster Sport, which accelerates from zero to 60 miles per hour in 3.7 seconds. We delivered our first right-hand drive model of the Tesla Roadster in January 2010, which we believe further demonstrates our ability to rapidly launch new products. Using a 240-volt, 40-amp outlet that is widely available in many homes in the United States for electric appliances, charging the Tesla Roadster battery pack to full capacity will take approximately 7 hours, which can be reduced to 4.5 hours with a professionally installed 70 amp circuit. As of Aug 31, 2010 we had sold 1,270 Tesla Roadsters to customers in 22 countries.

Second Generation Vehicle – Tesla Model S

We intend to continue to develop our electric powertrain technology and introduce additional vehicles, such as the Model S sedan, currently under development. The Model S is a four-door, five-passenger premium sedan that offers exceptional performance, functionality and attractive styling with zero tailpipe emissions at a compelling cost of ownership. We are designing the Model S to include a third row with two rear-facing child seats, subject to applicable safety regulations and requirements, allowing us to offer a seven passenger sedan. The drivable early prototype of the Model S was revealed to the public in March 2009 and despite a limited marketing effort, as of May 1st, 2011, we had received over 4600customer reservations with a minimum refundable payment of $5,000.

The Model S, which will compete in the premium vehicle market, has a significantly broader customer base than the Tesla Roadster. We currently intend to begin volume production of the Model S in 2012 with a target annual production of up to approximately 20,000 cars per year. We currently anticipate the base Model S will have an effective price of $49,900 in the United States, assuming and after giving effect to the continuation of a currently available United States federal tax

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credit of $7,500 for the purchase of alternative fuel vehicles. Even without this tax credit, we believe the Model S will be competitive from a pricing perspective with other premium vehicles.

In order to meet customer range expectations, we are designing the planned Model S to offer a variety of range options from 160 miles to 300 miles on a single charge, as projected using the EPAâs combined two-cycle city/highway test. The EPA has announced its intention to develop and establish new energy efficiency testing methodologies for electric vehicles, which we believe could result in a decrease to the advertised ranges of all electric vehicles, including ours. The Model S is being designed to be charged at home, but we are also planning to offer the capability to fast charge the vehicle in as little as forty-five minutes at commercial charging stations that we anticipate may be available in the future. The Model S battery pack is also being designed with the capability of being rapidly swapped out at specialized commercial battery pack exchange facilities that we anticipate may be available in the future.

The Model S is designed to have an adaptable platform architecture and common electric powertrain in order to allow us to efficiently create other electric vehicles, which may include, as examples, a crossover/sport utility vehicle, van or a cabriolet. By developing our future vehicles from this common platform, we believe we can reduce their development time and, as a result, reduce the required additional capital investment. Our long-term goal is to offer consumers a full range of electric vehicles, including a product line at a lower price point than the planned Model S. In May 2010, we publicly announced our intent to develop a third generation electric vehicle to be produced at our manufacturing facility in Fremont, California. We intend to offer this vehicle at a lower price point and expect to produce it at higher volumes than our planned Model S. We expect that this vehicle will be produced in Q3 2015, a few years after the introduction of the Model S.

Tesla Motors technology leadership and business prospects are further enhanced by the fact that 2 of the leading global automakers, Daimler AG (parent of Mercedes Benz) and Toyota Motors Corporation have both invested in Tesla as has the global leader in battery technology, Panasonic. But of perhaps greater import is the fact that both Daimler and Toyota purchase and deploy Tesla Motors EV powertrains in their own branded EVs. This is a powerful testament to the Teslaâs technology leadership but also helps us to fulfill our mission to accelerate the advent of capable and low cost EVs as both Daimler and Toyota can apply their already low cost production models and deliver more price accessible EVâs while Tesla is building that same capacity internally to create low cost Tesla branded offering. Tesla batteries and charging technology can be found in the Daimlerâs Smart EV and Mercedes A-Class vehicles and Tesla has developed the full powertrain for an EV version of the Toyota RAV4 which will go on sale in early 2012.

<u>What Policy Works</u>

Introducing an early stage technology product to the market and obtaining some traction for it is always a challenge. But when the incumbent technology enjoys a duration of primacy, an imbedded low cost infrastructure and market penetration such as that enjoyed by oil, the challenge is indeed daunting. Moreover, when one adds in the fact that oil and gas

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interests have a virtual monopoly on the energy and transportation policy and regulatory arena, the task looks virtually insurmountable.

Tesla Motors was launched out of the purest of free market financing models ï the application of risk capital to a promising new technology ï venture capital. Our long term success will only be insured by the adoption of our product by paying consumers and our ability to make and sustain a product while delivering it on a profitable basis. However, for this and other promising early stage energy technologies to gain a foothold in a market that it is monopolized by the mega-incumbents, policy makers and legislators must take action and create breathing room for these new technologies to gain a foothold in the commercial marketplace. This must happen if we ever have a hope to achieve the larger national and economic security advantages of a diversified transportation energy sector. So what can be done?

Economists would tell you that the strict application of objective principles in support of such a diversified energy sector would involve the application of a tax on the incumbent technology - petroleum. At a philosophical level, this would have the effect of pricing in the moral hazard associated with low cost gasoline and more explicitly reflect the externalities that are not priced into the cost of gasoline at the pump in the U.S. Moreover, there is empirical evidence that such policy works. The application of meaningful gas taxes in Europe and Japan have resulted in the emergence and meaningful market presence of multiple advanced technology vehicles on the roads there. These include hybrid technology in Japan where the hybrid Toyota Prius has been the leading car purchase in recent years and in the dominance of clean diesel vehicles in Europe. In both cases these societies have recognized their vulnerability as non-petroleum producers and have taken active steps to spur alternatives. For the same reasons, China has recently announced plans to mandate the development of an EV market as a response to their poor domestic oil supplies and their crushing problems with environmental degradation. But politician will quickly point to the fact that a gas tax is never going to happen in the U.S., or at the very least not until or unless we are faced with a pressing national security or economic crisis.

Where that leaves us is the implementation of modifications to the tax code with the goal being help to ameliorate the initially high cost early generation vehicles so that enough of them get on the road for consumers to try them and like them and for producers to be able to justify the billion dollar investments in design and tooling for newer, better, cheaper EVôs. This is a model that worked successfully to spur the market for hybrid technology ï an income tax credit that phased out with time and as certain volumetric milestones were achieved. There is currently such an EV tax credit on the books, but it is imprecise in its methodology and does not fully incentivize the desired technology development. Its flaw is that it caps the available credit value at a battery pack size of roughly 17 kilowatt hours (KwH). In contrast, given the fact that the more KwHôs of storage on board results in fewer oil driven miles, a well constructed tax credit would not cap the KwH credit and instead would reward each onboard KwH. This would incentivize the right behavior and would address the most important and currently most expensive component in the car ï the battery.

Access to low cost capital to incentivize manufacturers to invest in the development and manufacture of EVôs and other plug ï is is also of critical importance. In this respect, the DOEôs Advanced Technology Vehicles Manufacturing Program is a model for how the USG can through commercial style loans, accelerate the development of viable electric vehicles.

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Finally there are a number of low cost local market policies that can help to encourage the adoption and trial of EVõs. In this regard, access to HOV lanes on commuter arteries and free parking in densely populated areas already serve to incentivize EV adoption in places where they are applied.

What's the Point?

If you donõ believe that there is anything wrong with the monopoly that oil has on our transportation sector, if you donõ believe that we spend at least $75B in our national defense budget every year on securing access to foreign sources of oil and associated supply routes, if you believe itõs okay that our domestic economy is buffeted be the least disturbance in the oil supply market and that the average American household, spending roughly $4K/year on gasoline, is left vulnerable to dependence on this increasingly scarce resource, then there is nothing that can be said in support of Electric Vehicles that will sway naysayers to support the development of a market for this technology.

If however, one believes in the power of American innovation to fundamentally change and improve our individual lives and our larger societal interests then there is no question that this is the right time to step up and support the development of a viable EV market in the U.S. and to encourage in word and deed the American companies that are fighting to establish this product in the marketplace. If we do not, the proverbial frog will continue to boilé