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Economic Insights

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The Rise of the Electric Vehicle: Obstacles and Opportunities

Recent headlines claim that electric cars will soon rule the road, making the internal combustion engine a dinosaur of the future. Fossil fuel-burning engines have been written off many times before, but perhaps never as emphatically as today when electric vehicles receive the lion's share of media attention.

While there is plenty of debate on the speed of adoption of hybrid and all-electric vehicles, there has been less movement towards reducing reliance on gas and diesel engines. Investors, whether skeptics or boosters of alternative vehicles, have the same questions: When will the adoption of electric and autonomous vehicles become more widespread? And what impact would widespread adoption have on global energy prices, the automotive industry and technology?

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Preparing for an engineless future?

The global trend of vehicle electrification stems from the twin goals of lowering greenhouse gas emissions and reducing the costs of pollution on local economies. Rapid technological advances and climate-related regulations in many countries are creating swift changes to the traditional automotive model while, at the same time, providing exponential growth for some industry players. Due to the capital-intensive nature of the auto industry, significant design changes can cause extensive lead times. This makes predictions as to the rate of adoption of this new technology uncertain at best.

Nonetheless, European countries and their governments have been at the forefront of adopting an all-electric future, with France and Britain planning to ban sales of vehicles relying on gas and diesel engines by 2040. In Sweden, recent legislation could lead to carbon "neutrality" and an 85% reduction in emissions (based on 1990 levels) by 2045. It is expected that this aggressive goal will require a significant increase in electric and hybrid vehicles on Sweden's roads. European auto manufacturers are paying attention. In July, Sweden-based Volvo announced that all new models beginning with the 2019 line-up will be either all-electric or hybrid electric. Other nations are also incentivizing adoption through the use of subsidies.

China's push for electrification will be the fastest of all markets given the environmental challenges faced by the country. And some U.S. car makers are joining the electric bandwagon. In late August, Ford Motor Company and Chinese automaker, Anhui Zotye Automobile, agreed to discuss the creation of a joint venture to bring all-electric passenger cars to Chinese consumers. The venture would be wide-ranging, including development, manufacture, marketing and servicing demand for electric cars in China. Ford expects demand will reach four million vehicles by 2025.

However, consumer adoption of electric cars has been slow, particularly in the U.S. The reluctance of consumers to embrace electric cars en masse has been due to two key factors: higher cost and lower reliability.

On the cost side, all-electric vehicles are currently more expensive to purchase than hybrid and traditional automobiles. This price difference is projected to persist into the near future. In an attempt to attract more mainstream consumers, Tesla recently launched the Model 3 at a base price of $35,000 for the "standard" model. However, the base model price is deceiving, as this model is bare bones and includes zero options. Most buyers will end up paying significantly more by choosing fairly commonplace options. For example, simply changing the color from the standard black would see the initial $35,000 price tag jump into the low $40 thousands.

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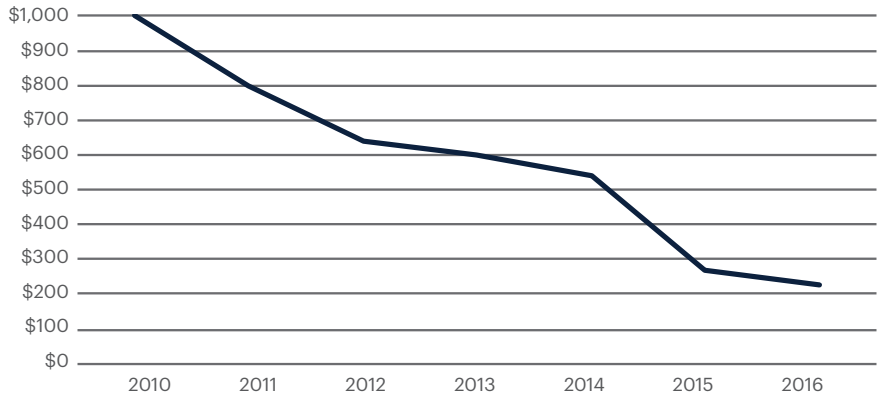
An additional cost consideration: as shown in the chart below, while the price of an average electric car battery pack per kilowatt hour (kWh) has declined significantly over time, the overall replacement cost remains out of reach for most consumers. Electric battery packs are priced per kWh with the current average cost over $200 per kWh. Higher-end electric vehicles, such as the Tesla Model X or S, run on a 60-100 kWh battery, meaning that a replacement battery would average around $16,000. However, even smaller, less expensive electric vehicles, such as the Nissan Leaf, run on 30 kWh batteries. Replacing a battery of this capacity carries an approximate average replacement cost of $6,000, not including labor. Even with future battery prices expected to decline to around $150/unit by 2020, this still puts the cost to replace a battery in the thousands of dollars.

Average Battery Pack Price ($ per kWh)



McKinsey & Company, "Electrifying insights: How automakers can drive electrified vehicle sales and profitability." January 2017.

Since the battery provides a limited range of drivability, consumers are also wary of electric car reliability. While an increasing number of drivers live in urban and suburban areas where trips are generally short and access to electricity is high, the fear of being stranded with a dead battery is still strong.

When a gas tank is empty, there are easy solutions—whether a walk to the gas station or a call to AAA—but a dead electric car battery is another matter. While battery life in electric vehicles is improving, with some new all-electric cars offering eight-year battery warranties,[1] consumers—who on average own their cars for just shy of 12 years[2]—remain somewhat wary of drivability range and replacement costs.

Advances in battery technology are under development across the U.S. but may take years to see widespread usage. One start-up in Massachusetts is working to replace lithium-ion batteries with rechargeable alkaline batteries which are cheaper to make and less likely to suffer from occasional combustion.

[1] https://www.nissanusa.com/electric-cars/leaf/charging-range/battery/
[2] IHS Markit

Lithium-ion batteries, however, will continue to provide power for hybrid and all-electric vehicles. Continuing improvements in design and manufacture have made these batteries more efficient and, of importance to consumers, more economically appealing. One risk factor to consider is the potential for lithium shortages which may push out the cost reduction curve for electric vehicle batteries, further delaying mass adoption.

Despite developments in battery technology, we believe electric vehicle sales will likely remain modest compared to non-electric cars and light trucks in the near future. The all-electric car stock currently comprises only 0.2% of the total number of passenger cars in circulation globally.[3] Most forecasts predict that all-electric vehicles will represent approximately 5% of the overall market by 2025. While this is a large and meaningful increase, it still represents a small fraction of the market. Autonomous vehicles may further enhance adoption rates and increase the number of electronic vehicle sales, but this would likely not be a factor until sometime after 2030.

Investment implications

While some predict that crude oil prices will see significant pressure from electric and autonomous vehicles, the magnitude of any future impact depends on the rate of adoption, which is largely unknown. Crude oil prices have declined by over 50 percent since their peak in mid-2014, though we believe that the decline is mainly supply-driven. Electric vehicles may have a longer-term impact on oil prices, but this is largely dependent on the speed at which the vehicles are adopted by mainstream consumers. While there are a variety of scenarios with regard to how quickly electric vehicles will move to the mainstream, even the most aggressive predictions do not put this before 2030.

The automobile industry has historically been slow to adapt to change, and that trend should continue going forward as the market inches toward electrification and autonomous vehicles. While traditional Original Equipment Manufacturers (OEMs) have been forced to shift towards electric, this has largely been outside the United States. Within the U.S., Tesla has the most advanced electric vehicle portfolio, but the lineup is not currently offered at prices or driving range reliability that are appealing to the mass market.

There are, however, several industries and companies that are looking far into the future to create the technologies and products necessary for hybrid, all-electric and autonomous vehicles. The inherently more complex vehicle architecture in the future requires more power management and data management capabilities well beyond the scope of the "Big 3" automakers.[4]

[3] International Energy Agency
[4] The "Big 3" U.S. automakers include General Motors, Ford, and Fiat Chrysler

Delphi Automotive is one of the largest global automotive systems suppliers, providing technology and power management solutions to both traditional OEMs and, in particular, to Tesla. OEMs rely on companies like Delphi to improve their software and artificial intelligence capabilities to build the car of the future. Increased electrification leads to higher dollars spent on the technology content per vehicle, and therefore potentially higher growth for Delphi over the next decade.

The enablers of technology innovation for automobiles and electric vehicles also include global semiconductor companies. We believe that semiconductor providers such as Texas Instruments, Microchip Technology, Analog Devices and Xilinx should benefit from the secular trend of increasing semiconductor content in electric vehicles, and eventually, fully autonomous vehicles.

The dollar amount of semiconductor content in an electric vehicle today is nearly five times that of a combustion engine vehicle, and the market opportunity for automotive semiconductors is $24 billion annually, growing at an 8% compound annual growth rate according to a McKinsey study.

Applications that require semiconductors include radar, LIDAR (Light Detection and Ranging), battery management and power management systems, infotainment solutions, and advanced driver assistance systems (ADAS). As auto interiors increasingly resemble the family living room with Wi-Fi, video screens, and music systems rivaling the home stereo, and drivers rely on computer systems to keep them in their lane and prevent them from making poor decisions, we believe demand for semiconductors will grow as auto engineers develop new features to keep occupants safe and entertained.

Conclusion

It is our opinion that market observers who focus on the extent to which electric vehicles may impact future gasoline demand risk overlooking compelling investment opportunities today. These include companies developing the technology and power solutions required for a future of reduced fossil fuel demand —whenever that day comes—while at the same time adapting their products to meet the needs of today's automotive customers.

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