



## Ford Motor Company's Global Electrification Strategy

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*Ford Motor Company has developed global platforms for its vehicles, including hybrid electric vehicles and forthcoming battery-electric and plug-in hybrids. Providing electrification technologies is a key element of Ford's broader strategy of producing vehicles that have improved fuel economy and reduced greenhouse emissions. The breadth of this effort—across a range of vehicle types—is unique in the automotive industry. Of particular importance is using the same vehicle platforms for electrified vehicles as for conventionally fueled vehicles in Ford's global strategy. Infrastructure development is a key element in the success of plug-in hybrid and battery electric vehicles. To this end, Ford is developing home-charging systems and communication networks that will enable drivers to find recharging stations.*

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The NABE Policy Conference offerings during the last 10 years have been increasingly at the forefront of emerging economic policy topics, with subject matter experts participating in panel sessions or giving keynote addresses on important issues confronting global policymakers. This year's session on "Electric Vehicles and Clean Energy Standards" was no exception.

As chief economist at Ford Motor Company, I represent a global automotive industry leader, with about 166,000 employees and 70 plants worldwide. Ford manufactures or distributes automobiles across six continents. I was honored to represent Ford in this session.

Ford's automotive brands include Ford and Lincoln, and the company provides financial services through Ford Motor Credit Company.<sup>1</sup> Through our company's global "One Ford" strategy, Ford has forged ahead to create global platforms (that is, the underlying architectures of our vehicles) and to provide cutting edge vehicles with content and features that are characterized by "Quality, Safe, Green, and Smart." The purpose of this paper is to focus on the "Green" component in general, and vehicle electrification in particular.

Along with improvements in our operating results, Ford continues to make significant progress on a number of the environmental and sustainability issues that have been identified as top public policy priorities, including improved fuel economy and reduced vehicle greenhouse gas emissions. In 2007, we launched our "blueprint for sustainability" plan, a series of near-, mid-, and long-term product actions that address climate change, energy security and affordability issues. The goal of this plan is to reduce the carbon dioxide emissions of our U.S. and European vehicles by 30 percent by 2020 relative to the 2006 model

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<sup>1</sup>For more information regarding Ford's products, visit <http://www.ford.com>.

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This paper is based on comments in a panel discussion "Electric Vehicles and Clean Energy Standards," at the NABE Policy Conference, March 7, 2011.

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year. The plan also commits us to being the best or among the best in fuel economy for every vehicle segment in which we compete.<sup>2</sup>

In the medium term (through 2020), Ford will fully implement known technologies to drive toward our sustainability objectives. These technologies include automatic stop-start (so that our vehicles save energy during the many times along a journey when a vehicle is waiting at a stop light or otherwise pauses), substantial weight reductions, and “low carb” diets for all our new vehicles. We will also add world-class battery electric and plug-in hybrid electric vehicles (PHEVs) to complement the Hybrid Electric Vehicles (HEVs) that Ford has already launched. Beyond 2020, our strategy will further leverage electrified vehicles, along with the utilization of alternative energy sources.

Ford customers have already begun seeing the benefits of our sustainability strategy. In today’s market, as gasoline prices have risen above \$4.00 per gallon in the United States since the September 2010 low of \$2.70 per gallon, fuel economy has consistently been the number one reason for purchases of hybrid automobiles in the United States. The hybrid Lincoln MKZ is the most fuel efficient luxury sedan in America, and the hybrid Ford Fusion is the most fuel efficient midsize sedan in the United States. Both of these vehicles achieve 41 city miles per gallon. The hybrid Ford Escape is the world’s most fuel efficient small utility, achieving 34 city miles per gallon. Furthermore, Ford has two nonhybrid vehicles—the Ford Fiesta and Ford Focus—with fuel economy ratings of 40 mpg, along with several additional nameplates that offer unsurpassed fuel economy in their segments.

Ford has launched a global electrification strategy that is unique among automotive manufacturers. In the near term, we have begun to migrate to advanced technologies across a range of cars, utility vehicles, and commercial vans. This includes world-class hybrids and the introduction of plug-in hybrids and battery electric vehicles. This near-term technology migration has been taking place since the 2004 launch of the Ford Escape HEV and has continued with the launch of the 2010 Fusion HEV and the launch of the Transit Connect Electric small commercial vehicle in 2010. Our upcoming electrification projects will launch in 2012 and 2013 in

the United States and Europe and include the Ford C-Max HEV, the Ford C-Max Energi plug-in HEV and the Ford Focus electric battery electric vehicle.

Ford’s electrification strategy is unique because it is leveraging our global platform strategy to offer a wide range of choice—different types of electrification (full HEVs, plug-in HEVs, and battery electric vehicles) available in different body styles—to allow our customers to select the option that best suits their needs. This is different from manufacturers who are developing electrified vehicles on special, uniquely tailored platforms or who are focusing on a more limited scope of electrification technologies.

We call this approach the “Power of Choice.” We are electrifying existing, traditional vehicle lines, rather than creating a specific electrified vehicle model. This will enable us to offer a broad portfolio of electrified vehicles. With Power of Choice, customers will be able to choose a variety of electrified powertrains, including:

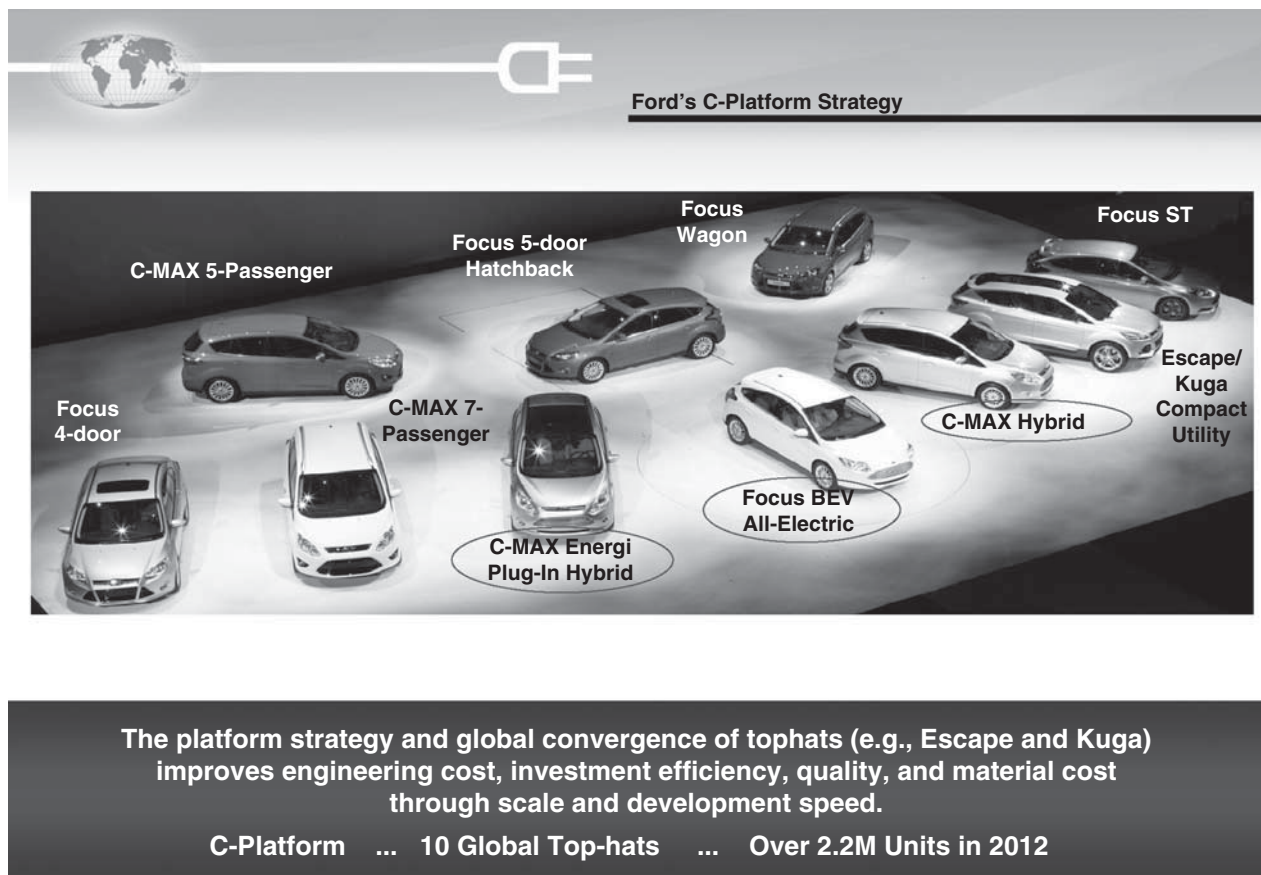
- HEVs—powered in part by a battery and in part by an internal combustion engine, depending on driving conditions, with onboard charging of the battery (that is, Ford Fusion and Escape Hybrids and Lincoln MKZ Hybrid currently available in North America).
- Plug-in HEVs—similar to a hybrid vehicle, but with a larger battery to provide more electric power in more driving conditions, with the battery capable of being charged externally (that is, Ford C-MAX Energi to be launched in North America and Europe in 2012 and 2013, respectively).
- Battery Electric Vehicle (BEV)—powered solely by battery, with no internal combustion engine, with the battery charged externally (for example, Ford Transit Connect BEV launched in North America in 2010 and to be launched in Europe in 2011 and Ford Focus Electric BEV to be launched in North America in late 2011 and in Europe in 2012).

In the near term, we have implemented the EcoBoost technology as a way of providing fuel efficiency across many vehicle lines. EcoBoost provides, for example, the power of a V-8 engine with V-6 fuel economy.

At the core of the electrification strategy is leveraging our global platform strategy to enable efficient migration of electrification technologies into multiple vehicle lines and regions.

<sup>2</sup>For more information on this topic, read our 12th Annual Sustainability Report, <http://corporate.ford.com/microsites/sustainability-report-2010-11/default>.

Figure 1. Ford's Global C-Platform Products



An example of how we have executed this strategy can be seen in our C-platform, illustrated in Figure 1. This is the common platform of vehicles such as the Ford Focus. By 2012, Ford will have over 2.2 million units of production across multiple vehicle “top hat” nameplate derivatives produced around the world. Having a platform designed for global use allows us to efficiently extend the benefits of electrification to multiple regions and provides flexibility to expand our electrification coverage into additional vehicle nameplates as customer demand warrants.

Our goal is to develop this portfolio of hybrid electric, plug-in hybrid electric and battery electric vehicles so that we are prepared for significant growth in this dynamic part of the automotive market. Ford’s projections are that by the end of this decade, electrified vehicles will comprise somewhere between 10 percent and 25 percent of our global mix. Within the 10–25 percent range, we expect that full hybrids will be the majority

(approximately 70 percent of the electrified vehicle mix) with plug-in hybrids making up 20–25 percent of the electrified vehicle mix, and battery electric vehicles making up the remainder. Our product plan is designed to achieve a balanced portfolio, global flexibility, and an ability to react to volatile external factors that are becoming a hallmark of the 21st century’s global economy.

One of the key elements that will impact adoption of plug-in hybrids and battery electric vehicles is the development of vehicle charging infrastructure. In this area, Ford’s priority is to focus on customers’ ability to charge at home for private vehicle owners and at depots for fleet owners. We believe these will be the predominant charging locations for the majority of owners, with workplace charging having the opportunity to act as either a main or secondary charge location. Public charging, although limited today, will be important as the population of plug-in vehicles grows. Providing additional charging locations will

help overcome anxiety over limited range among battery electric vehicle owners and will provide opportunities for charging plug-in HEVs to enable them to shift as many miles as possible from gasoline miles to electric miles. When considering the role of government and private investment in charging infrastructure, Ford believes that public-space charging stations should be the key focus area.

To enable customers to take maximum advantage of electrification technology, plug-in vehicle customers will need additional tools and connectivity capability—we call this the “electric lifestyle.” We have introduced the MyFord Mobile feature for our plug-in vehicles, with uniquely tailored in-car information building on MyFord Touch technology. MyFord Mobile provides range, destinations and charge point locations for the electrified vehicle, along with the ability for owners to customize their vehicle charging times, alert customers if charging is interrupted, and optimize features like preconditioning (heating or cooling the vehicle to a comfortable level with grid energy before the driver begins their trip). There will also be smartphone mobile apps that will help customers to monitor and control vehicle charging remotely. This includes locating charging stations and sending these locations to the vehicle. Also, Ford has leveraged the Smart Gauge with Eco Guide feature from the Fusion HEV to provide displays that show regenerative brake performance and that highlight ways to improve the vehicle’s range. The apps will also include icons to show additional range capability beyond one’s charge point destination.

Ford’s unique home charging solution has two key components. The first is a compact and easy-to-install charging station in a partnership with Best Buy for installation, which has allowed Ford to offer home charging at a significantly lower price than our competitors. The second feature is Value Charging, powered by Microsoft, which enables customers to charge when electricity prices are lowest.

In summary, Ford’s approach to electrification is unique. It builds on our broad-based sustainability strategy to provide affordable, energy-saving technologies to millions of customers. Ford is electrifying global platforms with all three forms of electrification—hybrids, plug-in hybrids, and battery electric—in order to provide choice and to drive volume and affordability. Finally, Ford is not only developing vehicle technology; it is also working with partners to deliver the infrastructure and connectivity solutions that will help customers to fully optimize their electrified vehicle experience.

Detailing Ford’s electrification strategy is a way to inform readers about its efforts to meet the automobile sector’s energy, environment, and sustainability challenges. High oil prices reinforce the global focus on energy costs, energy independence, energy security, and sustainability. Geopolitical developments heighten the importance of increasing fuel efficiency for all of our cars, utilities, and trucks in order to reduce dependency on foreign sources of oil in a volatile world, and Ford has always been at the forefront of “pushing the envelope” on environment and sustainability. It is my hope that this paper provides a useful template for private sector initiative and public policy as they relate to the automotive manufacturing sector’s relationship to energy and the environment. Setting prudent standards is more than just “flipping a switch”—it requires innovation, focus, and scarce resources that are dedicated to a plan to achieve affordable, desirable cars, utility vehicles, and trucks that results in energy independence, energy security, and sustainability.

The way forward requires partnership and working together among companies, governments, and academia—combined with astute attention to people’s choices and aspirations. Even as we practice the One Ford approach, we know that no single entity can by itself provide the leadership and resources to reach the full potential of electric vehicles and clean energy standards.

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