Climate Change

During 2008 we:
- Accelerated plans to introduce electric vehicles
- Improved fleet fuel economy

In early 2008, Ford announced a goal to reduce carbon dioxide (CO_2) emissions[1] from its U.S. and European new vehicles by 30 percent by 2020, relative to a 2006 model year baseline. We also set out a technology migration plan – embodied in our blueprint for sustainability – that details our near-, mid- and long-term plans to meet this goal. Despite challenging economic conditions, we are making significant progress in implementing the plan and are on track to exceed the goal.

- We announced an ongoing commitment, beginning with the 2010 model year, that all new vehicles will be best in class or among the best in class for fuel economy in their segment. All of the 2010 model year vehicles released in North America as of May 2009, as well as many 2009 model year vehicles, meet this commitment.
- We introduced the EcoBoost™ engine on the 2010 Ford Flex, Lincoln MKS and Lincoln MKT. It will also be available in several additional 2010 model year vehicles. EcoBoost is a gasoline turbocharged direct-injection technology, which delivers up to 20 percent better fuel economy, 15 percent fewer CO_2 emissions and superior driving performance, compared to larger displacement engines.[2] EcoBoost engines are among the many new technologies that are improving fuel economy across our vehicle lines.
- We have announced plans to introduce six small vehicles from the Company's acclaimed European line-up to North America by 2012, including the new Fiesta in early 2010 and the new Focus later in 2010.
- We have accelerated elements of the technology migration plan, particularly the introduction of all-electric vehicles. We announced that the Transit Connect, developed in collaboration with Smith Electric Vehicles, will be the first of Ford's battery electric vehicles (BEVs), with models available in 2010 in North America for low-volume fleet sales. By 2011, Ford will bring a battery electric Focus to North America, followed by next-generation hybrid and plug-in hybrid vehicles in 2012.

These actions demonstrate that our blueprint for sustainability was not the first step in reorienting our product line to the realities of global climate change. Rather, it was the culmination of years of work that included developing a sophisticated model to test scenarios for reducing carbon emissions (see "A Look Inside the "Black Box") and planning our product portfolio to align with the needed reductions.

Our climate change strategy is based on delivering products that our customers want while doing our share to stabilize greenhouse gas (GHG) concentrations in the atmosphere at levels generally accepted to minimize the effects of climate change.[3] This can only be achieved by significantly and continuously reducing GHG emissions over a period of decades. Reducing emissions by the amount required calls for an integrated approach – a partnership of all stakeholders, including the automotive industry, the fuel industry, government and consumers. It will require considerable increases in vehicle fuel economy globally, as well as the development of lower-carbon fuels.

We are committed to advocating for effective and appropriate climate change policy in the United States and around the world. We are an active member of the U.S. Climate Action Partnership (USCAP), a coalition of diverse stakeholders that released its ***Blueprint for Legislative Action*** in January 2009, setting out consensus recommendations for U.S. climate protection legislation. The USCAP blueprint includes an aggressive emission-reduction schedule, a proposed scope of coverage for a cap-and-trade program, and recommendations for how to include as much of the U.S. economy under the cap as administratively and politically feasible.

Our CO_2 product goal is aligned with the USCAP recommendations and with the broad goal of climate stabilization.[4] It also aligns our product plans to meet or exceed new fuel economy requirements in the

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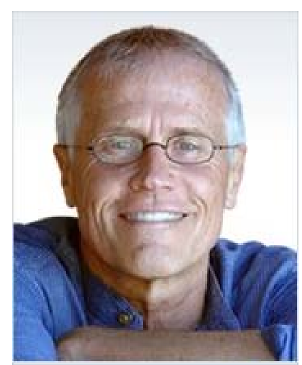

PERSPECTIVES ON SUSTAINABILITY

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U.S. and Europe. We recognize that future developments in technologies, markets, policy actions and even the natural manifestations of climate change are all uncertain. Accordingly, we will continue to monitor and adjust the goal based on changing conditions.

In this section of our Sustainability Report, we provide an overview of GHG emissions, including data on the contribution of light vehicles, life-cycle CO_2 emissions from a typical vehicle, Ford's own climate "footprint" and stabilization pathways. We also discuss the risks and opportunities the climate change issue poses for Ford, our climate change strategy – including our blueprint for sustainability – and how we are addressing climate change public policy issues.

1. CO_2 is the major long-lived greenhouse gas (GHG). Greenhouse gases trap heat in the Earth's atmosphere, contributing to global climate change. CO_2 is the most prevalent GHG associated with the manufacture and use of our products, so our targets are set for CO_2 rather than all GHGs. See the Beyond CO_2 section for discussion of other GHGs.
2. When fuel economy is calculated as miles per gallon, EcoBoost delivers up to 20 percent better fuel economy compared to larger displacement engines. When fuel economy is calculated in liters per 100 km, as it is in most of Europe, EcoBoost delivers up to 15 percent better fuel economy. The benefits of EcoBoost are the same in each case; the difference is only in the units used in the calculations. This is because the conversion between miles per gallon, which measures distance traveled per unit of fuel consumed (wherein more is better), and liters per 100 km, which measures fuel consumed per unit of distance traveled (wherein less is better) is a reciprocal or inverse proportion. Therefore, the resulting figures are different even though the actual benefit received is the same.
3. Currently, the generally accepted range of atmospheric CO_2 concentration required to avoid the most serious effects of climate change is 450 to 550 parts per million (ppm) (see Stabilizing Atmospheric CO_2 Levels).
4. Our target is aligned with a 500 ppm stabilization pathway. If fuel providers, consumers and governments deliver their contributions, reaching a 450 ppm stabilization pathway for the light-duty transportation sector is possible.

RELATED LINKS

In This Report:

Blueprint for Sustainability: An Overview

Electrification: A Closer Look

Delivering More Fuel-Efficient Vehicles

Vehicle Web Sites:

Ford Flex

2010 Lincoln MKS

2010 Lincoln MKT

External Web Sites:

U.S. Climate Action Partnership

Greenhouse Gas Emissions Overview

Climate change is the result of an increase in heat-trapping (greenhouse) gases in the atmosphere. Carbon dioxide (CO_2) is the major long-lived greenhouse gas (GHG). The burning of fossil fuels (to provide electricity, heat and transportation, and to support industry and agriculture), as well as deforestation, lead to emissions of CO_2 and increased levels of atmospheric CO_2.

Global CO_2 Emissions

Globally, emissions from light-duty vehicles comprise about 11 percent of all fossil fuel CO_2 emissions. In the United States, cars and light-duty trucks account for approximately 20 percent of fossil fuel CO_2 emissions, or approximately 4 percent of global fossil fuel CO_2 emissions. In Europe, passenger cars and light-duty trucks account for approximately 17 percent of fossil fuel CO_2 emissions, or about 3 percent of global fossil fuel CO_2 emissions (see Global Fossil Fuel CO_2 Emissions).

Until very recently, the United States was the largest CO_2 emitter. It is now widely believed that China has overtaken the U.S. in CO_2 emissions, although per capita emissions of CO_2 in the U.S. remain substantially higher than those in China.

Life-Cycle Vehicle Emissions

Most of the life-cycle CO_2 emissions from vehicles are released when the vehicles are driven, rather than when they are made or disposed of. As vehicle fuel efficiency improves and lower-carbon fuels are made available, the relative contribution of CO_2 emissions from the fuel-consumption phase will likely decrease (see Life-Cycle Assessment of Vehicle CO_2 Emissions).

Ford's Greenhouse Gas Emissions

GHG emissions attributable to Ford's activities include emissions from our facilities, from the transportation of our products and people, from the vehicles we produce once they are in use by customers, and from our suppliers. In this report, we provide data on CO_2 emissions from our facilities and our U.S. and European new products. Additional information on our GHG footprint is found below.

Greenhouse Gas Emissions Snapshot

In 2001, we estimated the greenhouse gas emissions from our operations and products as part of an assessment of the impact of the climate change issue on our Company. We updated this estimate for our 2006/7 report.

Many assumptions were required to generate the estimate, and we do not control all of the factors that influence its magnitude. Therefore, we do not use this estimate as an ongoing performance measure. We intend to continue to reduce our facility GHG emissions, improve the energy efficiency of our operations and the vehicles we sell, closely track those results and update the estimate in the future.

Supply Chain

We are currently evaluating climate change risks and opportunities across our supply chain and searching for new opportunities and relationships that will enhance supplier environmental performance. Within the Aligned Business Framework agreement with suppliers, environmental leadership is integral to overall business performance metrics. Climate-change-related activities are highlighted as potential leadership opportunities.

In addition, our requirement that suppliers implement robust environmental management systems will better enable them to understand, measure and report their emissions. We also will seek out opportunities to partner with suppliers to improve the greenhouse gas emissions performance of our products and processes, and improve energy efficiency throughout the life-cycle, including the supply chain.

Beyond CO_2

We are also addressing other (non-CO_2) greenhouse gases such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), nitrous oxide (N_2O) and sulfur hexafluoride (SF_6). We have prohibited SF_6 in tires and PFCs in open systems since 1999. We are minimizing the use of HFCs in vehicle air

RELATED LINKS

In This Report:
- Global Fossil Fuel CO_2 Emissions
- Life-Cycle Assessment of Vehicle CO_2 Emissions
- Environment: Data
- Suppliers
- Renewable/Biofueled Vehicles

conditioning and prohibit the use of HFCs in other on-board vehicle applications (e.g., as used in some spare tire kits). We are working with our suppliers to optimize air conditioning efficiency, reduce refrigerant leakage rates and investigate alternatives. We are also actively conducting research to evaluate the environmental fates of potential alternative air conditioning refrigerants to replace HFC-134a and have made our research data available to the scientific community. We prohibited the use of SF_6 in magnesium casting as of January 2004 through our Restricted Substance Management Standard.

The vast majority of the life-cycle greenhouse gases associated with motor vehicle use are in the form of CO_2; relatively small amounts of other greenhouse gases are emitted. A small amount of methane (CH_4) is formed in the engine and emitted into the atmosphere. We have assessed the contribution to climate change made by methane emissions from vehicles as about 0.3 to 0.4 percent of that of the CO_2 emissions from vehicles. We also try to minimize N_2O tailpipe emissions. We have assessed the contribution to climate change from N_2O emissions from vehicle tailpipes (not including potential emissions associated with fuel production) as about 1 to 3 percent of that of the tailpipe CO_2 emissions from vehicles. We are in the process of assessing N_2O emissions associated with fuel (especially biofuel) production.

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Global Fossil Fuel CO_2 Emissions in 2005

The graphics below provide a breakdown of estimated 2005 fossil fuel CO_2 emissions by region, by sector and by mode within the transportation sector in the United States, China, Europe and India. The data were taken from reports published by the International Energy Agency, European Environment Agency and U.S. Environmental Protection Agency. As these graphics show, the magnitude and distribution of sources of fossil fuel CO_2 emissions differ widely by region. On a global basis, light-duty cars and trucks are responsible for approximately 11 percent of global fossil fuel CO_2 emissions.

CO_2 Emissions from Fuel Combustion

Region	% of global CO_2 emissions	tonnes CO_2 per capita
United States	21	19.61
China	19	3.88
Europe	15	8.09
India	4	1.05
Russia	6	
Japan	4	
Other	31	
World	**100**	**4.22**

Fossil Fuel CO_2 Emissions by Sector

% of region's total CO_2 emissions

Sector	United States	China	Europe	India
Electricity and Heat	43	49	35	58
Transport	31	7	24	8
Manufacturing	11	31	17	21
Residential	6	5	12	6
Other	9	8	12	7

CO_2 Emissions from Transport Sector

United States

% of CO_2 emissions from transport sector

Cars	35
Light-Duty Trucks	27
Heavy- and Medium-Duty Trucks	21
Aviation	10
Rail	3
Ships and Boats	2
Buses	1

Other	2

China

	% of CO_2 emissions from transport sector
Trucks	28
Cars	21
Buses and Motorcycles	20
Aviation	6
Other	25

Europe

	% of CO_2 emissions from transport sector
Passenger Cars	61
Heavy-Duty Vehicles	21
Light-Duty Vehicles	7
Aviation	3
Ships and Boats	3
Buses and Two-Wheelers	3
Other	2

India

	% of CO_2 emissions from transport sector
Trucks and Buses	65
Cars	16
Two-Wheelers	8
Aviation	1
Other	10

Life-Cycle Vehicle CO_2 Emissions

Life-cycle assessment tracks emissions generated and materials consumed for a product system over its entire life-cycle, from cradle to grave, including material production, product manufacture, product use, product maintenance and disposal at end of life. For vehicles, this includes the environmental burdens associated with making materials (e.g., steel, aluminum, brass, copper, plastics, etc.), fabricating them into parts, assembling the parts into a vehicle, operating the vehicle over its entire lifetime, producing fuel for the vehicle, maintaining the vehicle and finally disposing of the vehicle at the end of its life. Life-cycle assessment is an essential tool when thinking about the environmental impacts of complex systems.

The table below details the results of a life-cycle analysis for a representative midsize car and SUV in the United States. At present, life-cycle CO_2 emissions from vehicles are dominated by CO_2 released during fuel consumption. Product disposal has a minor impact on airborne emissions and energy consumption relative to other phases of the product system. As vehicle fuel efficiency improves and lower carbon fuels are made available, the relative contributions of fossil CO_2 emissions from the fuel consumption phase will probably decrease.

Many assumptions were required to generate this analysis, several of which we have little or no control over. Therefore, we do not expect to use the estimate as an ongoing performance measure. The analysis did, however, enable us to gain a better perspective of life-cycle emissions and hence understand the opportunities for reducing emissions.

	Midsize car		Midsize SUV	
	Tonnes of CO_2	% of total	Tonnes of CO_2	% of total
Raw material production (steel, aluminum, plastics, ...)	3.5	5.6%	4.3	5.2%
Manufacturing/assembly	2.6	4.2%	2.6	3.2%
Ford manufacturing logistics	0.3	0.5%	0.3	0.4%
Fuel (120,000 miles [192,000 km]) [well to wheels]	55.1	88.6%	74.6	90.4%
Maintenance and repair	0.6	1.0%	0.6	0.7%
End of life/recycling	0.1	0.2%	0.1	0.1%
Total life-cycle	**62.2**	**100%**	**82.5**	**100%**

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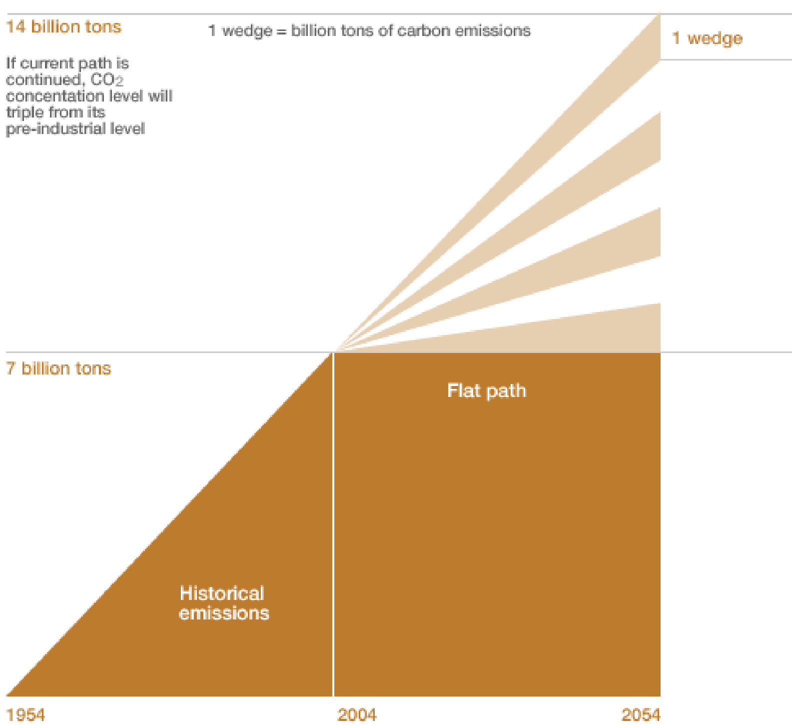
Climate Stabilization

The assessment of the science of global warming issued in February 2007 by the Intergovernmental Panel on Climate Change concluded that, "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic [man-made] greenhouse gas emissions." It also concluded that the effects of this warming, such as melting snow and ice and rising sea levels, are being felt, and that, "Continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century."[1]

Ford researchers have played a leading role in scientific research to understand and quantify the contribution of vehicles to climate change. We have also worked with a variety of partners to understand the current and projected man-made GHG emissions and the steps that can be taken to reduce them. Many scientists, businesses and governmental agencies have concluded that stabilizing the atmospheric concentration of CO_2 at 450–550 parts per million (ppm) may help to forestall or substantially delay the most serious consequences of climate change.

The Carbon Mitigation Initiative, a research partnership based at Princeton University and supported by BP and Ford, has examined what it would take to stabilize atmospheric CO_2 at 500 ppm compared with the level in 2009 of approximately 386 ppm and the pre-industrial level of approximately 270–280 ppm. Researchers identified a set of stabilization strategies they call "wedges." Each wedge represents the implementation of a strategy that could cut global annual carbon emissions by 1 billion metric tons by 2054. The wedges concept is a powerful tool to demonstrate the scale of the climate stabilization challenge, the need for an approach that includes many different economic sectors (power, transportation, agriculture, industry), and the options that are available. The diagram below shows that stabilization would require the successful implementation of at least seven of these 15 approaches to achieve the annual reduction of 7 billion metric tons of carbon emissions from business-as-usual forecasts.



While the wedges may be theoretically achievable, they were not evaluated for their economic, market or political feasibility. Many would require the rapid scale-up of emerging technologies. Nevertheless, the wedges approach helps to highlight the challenge of achieving meaningful reductions in greenhouse gases.

RELATED LINKS

External Web Sites:

Intergovernmental Panel on Climate Change

Carbon Mitigation Initiative

According to the Princeton researchers, each of the following strategies has the potential to reduce carbon emissions by one wedge.

Efficiency

- Double the fuel efficiency of two billion vehicles
- Decrease the number of vehicle miles traveled by half
- Use best efficiency practices in all residential and commercial buildings
- Produce current coal-based electricity with twice today's efficiency

Biomass Fuels

- Increase ethanol production 50 times by creating biomass plantations with an area equal to one-sixth of world cropland

Carbon Capture and Storage

- Capture and store emissions from 800 coal electric plants
- Produce hydrogen from coal at six times today's rate and store the captured CO_2
- Capture carbon from 180 coal-to-synfuels plants and store the CO_2

Nuclear

- Add double the current global nuclear capacity, to replace coal-based electricity

Wind

- Increase wind electricity capacity by 50 times its present value, for a total of two million large windmills

Solar

- Install 700 times the current capacity of solar electricity
- Use 40,000 square kilometers of solar panels (or four million windmills) to produce hydrogen for fuel cell vehicles

Fuel Switching

- Replace 1,400 coal electric plants with natural gas-powered facilities

Natural sinks

- Eliminate tropical deforestation and create new plantations on non-forested land to quintuple current plantation area
- Adopt conservation tillage in all agricultural soils worldwide

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1. *Climate Change 2007: the Physical Science Basis Summary for Policymakers*, Intergovernmental Panel on Climate Change, February 2007.

Climate Change Risks and Opportunities

As evidence mounts about the effects of climate change, the urgency to act increases. The next few years will likely see both comprehensive U.S. climate legislation and a new global climate change treaty. Concerns about climate change and growing constraints on the use and availability of carbon-based fuels affect our operations, our customers, our investors and our communities. The issue warrants precautionary, prudent and early actions to enhance our competitiveness and protect our profitability in an increasingly carbon-constrained economy. Thus, the risks and opportunities for Ford presented by the climate change issue have never been more important. These risks and opportunities include the following.

Markets

Our markets changed dramatically during 2008. The serious global recession has depressed auto sales across all markets. Record oil prices in the first half of the year accelerated the shift from larger vehicles and light trucks to smaller, more fuel-efficient vehicles (including cars and crossovers) and diesel-powered vehicles. Oil prices then plunged during the second half of the year, which may have dampened interest in hybrid and other vehicles with superior fuel economy. However, we anticipate – and many of our customers believe – that volatile and increasing energy costs are likely to continue to drive the market for fuel-efficient vehicles in the long run. Energy security is also a major concern in several markets in which we operate.

Within these broad trends, there are regional differences. In North America, new regulations (discussed below and in the Climate Change Policy and Partnerships section), volatile fuel prices and energy security concerns are encouraging the sales of smaller and more fuel-efficient vehicles. In emerging markets, the growth in vehicle sales is raising concerns about emissions and congestion. In Europe, the long-term trend of high-priced fuel and more fuel-efficient vehicles has led to a major shift toward diesel-powered vehicles, which now make up more than half of all new vehicle sales. This trend is reinforced by sales incentives in some European countries designed to encourage new vehicle sales, with the aim of reducing carbon dioxide emissions from older, less-efficient vehicles. Some of these incentives are bound to upper limits of CO_2 emissions of 160 g/km and less, which has boosted sales of small cars. Other schemes are linked to regulatory emissions standards (e.g. Euro 4).

These market shifts are very significant to our Company. Everywhere we operate, the future financial health of our Company depends on our ability to predict market shifts of all kinds and to be ready with the products and services our customers demand.

Our product globalization strategy is designed to help us respond to changing markets and regional preferences. We are leveraging our best technology from around the world to create global platforms that offer superior fuel economy, safety, driving dynamics and customer features. We then tailor each global platform to national or regional preferences and requirements. New technology is also cutting the time required to bring new vehicles to market, which helps us respond more effectively to the ever-increasing pace of change in our markets.

Please see the Economy section for further discussion of our changing markets and how we are responding to them.

Regulations

Climate-related legislation and regulation increasingly affect our business, including our manufacturing facilities, the emissions from our vehicles and, less directly, our markets. In the United States, for example, the new Obama Administration is committed to passing comprehensive federal climate legislation, which would affect both our vehicles and our operations.

At the end of 2008, the European Parliament passed legislation that will result in the regulation of the CO_2 emissions of our fleet of vehicles in Europe. In addition, the EU's Emission Trading Scheme regulations apply to eight Ford and Volvo facilities in the UK, Belgium, Sweden and Spain. Ford anticipated the start of this trading scheme and established internal business plans and objectives to maintain compliance with the regulatory requirements. These issues are discussed in more detail in the Climate Change Policy and Partnerships section.

In Asia, Japan, South Korea and Taiwan have adopted fuel-efficiency targets. For example, Japan

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External Web Sites:
EU Emission Trading Scheme
National Highway Traffic Safety Administration

established fuel-efficiency targets for 2010 passenger car and commercial trucks, with incentives for early adoption. Also, the Chinese government has introduced weight-based fuel-consumption standards for passenger cars and light-duty commercial vehicles. Ford's product offerings comply with the standards in all of these markets.

We have established global roles, responsibilities, policies and procedures to help ensure compliance with emissions requirements, and we participate in trading initiatives worldwide.

Investment Community

Both mainstream investment analysts and those who practice socially responsible investing are assessing companies in the auto sector for their exposure to climate risks and their positioning to take advantage of opportunities created by the issue. The Carbon Disclosure Project, for example, provides investors with a standard set of disclosures about company responses to climate change. We have participated in the project since its inception and have submitted six publicly available reports.

Ford's ability to comply with climate-related regulations and respond to markets influenced by the issue is of increasing interest to investors. Thus, providing climate-change-relevant information to investors and shaping our business strategy with climate change in mind are important elements of maintaining access to capital.

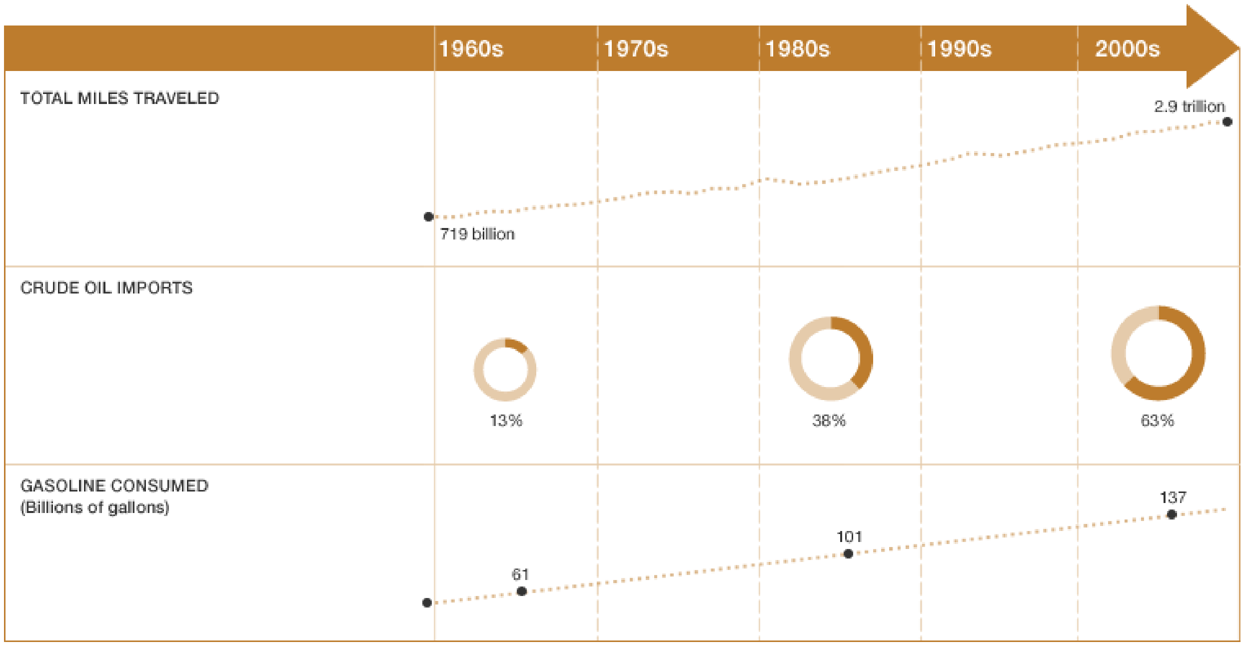
Physical Risks

Global climate change raises the potential for shifting patterns of extreme weather and other risks to our facilities. For insurance purposes, we assess the risks each of our facilities faces (with input from third-party engineers) at least annually. This risk assessment is updated based on new data and takes into account the risk of exposure to hurricanes, tornadoes, other storms, flooding and earthquakes. As a result of this process, we believe we have a good understanding of the physical risks faced by our facilities and how those risks are changing over time.

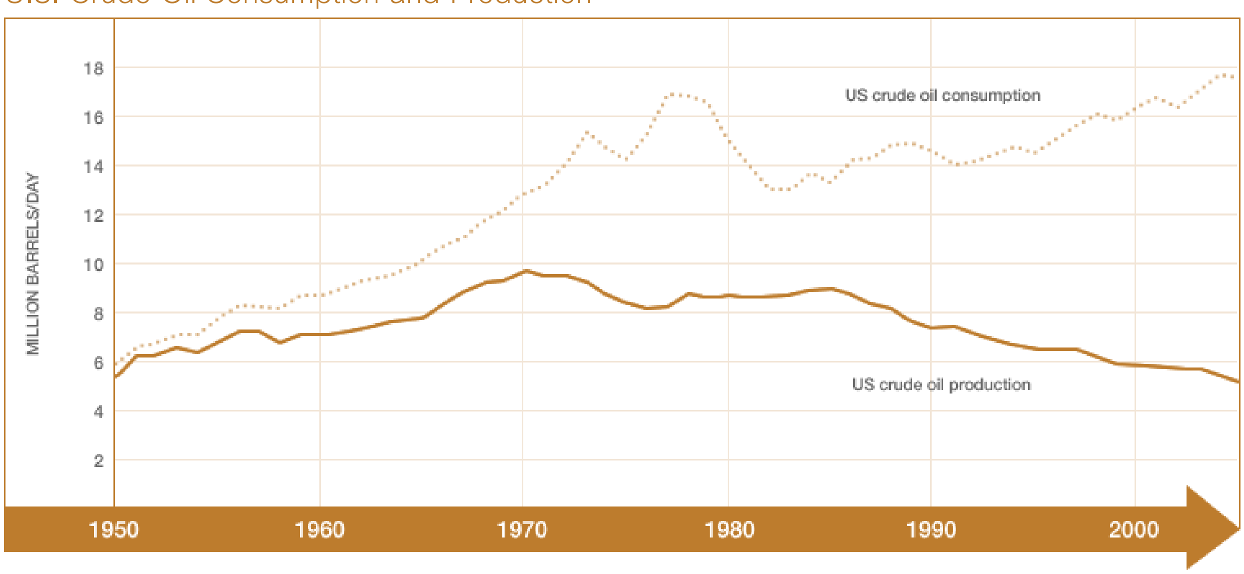
Extreme weather has the potential to disrupt the production of natural gas, a fuel necessary for the manufacture of vehicles. Supply disruptions raise market rates and jeopardize the consistency of vehicle production. To minimize the risk of production interruptions, Ford has established firm delivery contracts with natural gas suppliers and installed propane tank farms at key manufacturing facilities as a source of backup fuel. Higher utility rates have prompted Ford to revisit and implement energy-efficiency actions that previously did not meet our internal rate of return.

U.S. Energy Security

The following charts illustrate the primary issue underlying concerns about U.S. energy security – crude oil consumption is increasing, while domestic energy production is decreasing. Therefore, the United States is increasingly reliant on imported crude oil. The first chart shows the increase in the number of miles U.S. drivers are traveling, the increasing consumption of gasoline, and the increasing percentage of fuel consumption being filled by imported crude oil. The second chart shows the increase in U.S. demand for crude oil and the simultaneous decrease in U.S. crude oil production.



U.S. Crude Oil Consumption and Production



Source: Energy Information Administration, Annual Energy Review 2005, Table 5.1

Blueprint for Sustainability: An Overview

MATERIAL ISSUES
Materiality Analysis
Climate Change
Greenhouse Gas Emissions Overview
Climate Change Risks and Opportunities
Blueprint for Sustainability: An Overview
Sustainable Mobility Governance
Climate Change Strategic Principles
Climate Change-Related Commitments and Progress
Sustainable Technologies and Alternative Fuels Plan
Progress and Performance
Climate Change Policy and Partnerships
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To respond to the risks and opportunities posed by the climate change issue, our long-term strategy is to contribute to climate stabilization by:

- Continuously reducing the greenhouse gas emissions and energy usage of our operations
- Developing the flexibility and capability to market more lower-GHG-emission products, in line with evolving market conditions
- Working with industry partners, energy companies, consumer groups and policy makers to establish an effective and predictable market, policy and technological framework for reducing road-transport GHG emissions

We have set a goal to reduce the emissions of our U.S. and EU new vehicle CO_2 emissions by 30 percent by the year 2020, compared to a 2006 model year baseline. Our blueprint for sustainability, unveiled in last year's Sustainability Report, spells out our product strategy to meet this goal. The blueprint builds on a series of commitments the Company has made, or participated in, to reduce the greenhouse gas emissions from our products and operations.

The blueprint's product strategy – called the Sustainable Technologies and Alternative Fuels Plan – details the near-, mid- and long-term steps we are taking – many of which are already underway – to develop and deploy vehicle and fuel technologies to implement the blueprint. The blueprint is supported by our sustainable mobility governance, which establishes structures and accountability for implementing the strategy.

To develop the blueprint, we analyzed the reduction in global GHG emissions that will be required to achieve the goal of climate stabilization. The analysis showed that very large reductions in emissions will be required to achieve the carbon-dioxide concentration accepted to minimize environmental impacts. (See Stabilizing Atmospheric CO_2 Levels.) Next, we analyzed the current and projected contribution of light-duty cars and trucks to global GHG emissions (currently about 20 percent of CO_2 emissions in the U.S. and about 11 percent globally) and the reduction needed to contribute to stabilization.

We used these assumptions in a model that considers both vehicle technology and fuel options. The purpose of the model was to determine the best combination of options that will yield the required emissions reductions at the most affordable cost. We then developed scenarios to assess how the vehicle and energy sectors can work together, each developing its own optimal but coordinated strategies on fuels and vehicle technologies. The output of this model and analysis is the Sustainable Technologies and Alternative Fuels Plan.

Our product strategy is complemented by actions to reduce energy use and GHG emissions in our operations. From 2000 to 2008, we improved the energy efficiency of our North American facilities by 35 percent and reduced global CO_2 emissions by 45 percent overall and 24 percent per vehicle. The U.S. Environmental Protection Agency has recognized our energy conservation efforts four years in a row (a first for an automaker), most recently with the 2008 Energy Star Sustained Excellence Award. Please see Operational Energy Use and Greenhouse Gas Emissions for a detailed account of our progress in cutting energy use and improving the energy efficiency of our operations.

ENERGY STAR AWARD 2009
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Our blueprint was developed to deliver the emissions reductions required for climate stabilization at the most affordable cost.

RELATED LINKS
In This Report:
Sustainability Governance
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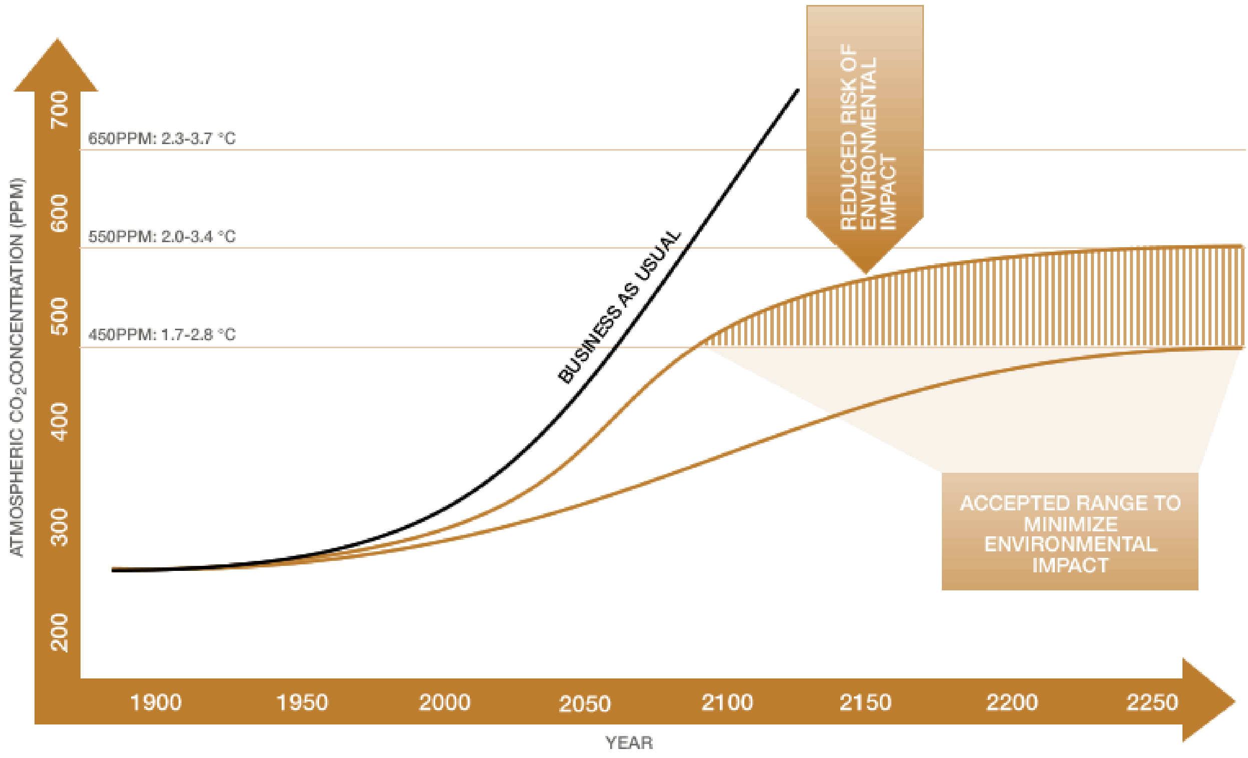
Energy Star Award

Stabilizing Atmospheric CO_2 Levels


ATMOSPHERIC CO_2 CONCENTRATION (PPM)
200
300
400
500
600
700
650PPM: 2.3-3.7 °C
550PPM: 2.0-3.4 °C
450PPM: 1.7-2.8 °C
BUSINESS AS USUAL
REDUCED RISK OF ENVIRONMENTAL IMPACT
ACCEPTED RANGE TO MINIMIZE ENVIRONMENTAL IMPACT
1900
1950
2000
2050
2100
2150
2200
2250
YEAR

Sustainable Mobility Governance

To plan and implement our blueprint for sustainability, we have established sustainability-related governance systems, which include a strong focus on fuel economy and CO_2 improvements. The strategic direction is provided by a senior executive committee, made up of vice president and executive stakeholders, who guide the development of the vision, policy and business goals. (See Governance and Management Structures.)

Related executive planning teams are responsible for developing detailed and specific policy, product and technical analyses to meet objectives. These teams base their plans on scientific data and promote actions that will help achieve the Company's environmental ambitions, recognizing the need to use a holistic approach to effectively protect the environment. Metrics have been established and are reviewed regularly to ensure satisfactory progress. We have also developed strategic principles to guide our approach.

In late 2008, the Environmental and Public Policy Committee of the Board of Directors was renamed the Sustainability Committee, reflecting the committee's responsibilities for assisting management in the formulation and implementation of policies, principles and practices to foster the sustainable growth of the Company on a worldwide basis. During 2008, the Committee reviewed progress on key elements of the climate change strategy.

Climate Change Strategic Principles

Our approach to GHG stabilization is aligned around four key strategic principles:

1. Technical, economic and policy approaches to climate change need to recognize that CO_2 molecules (or GHG equivalents) produced by human activity make the same contribution to the atmosphere's concentration of greenhouse gases. Once those molecules reach the atmosphere, they contribute to the greenhouse effect, regardless of the source. However, the cost of mitigating those emissions varies significantly depending on their source, and we should attempt to achieve the most economically efficient solutions possible.
2. The transportation sector represents a closely interdependent system, characterized by the equation: "Vehicle + Fuel + Driver = GHG emissions." Each link in this chain depends on the others. For example, vehicle manufacturers can bring to market flexible fuel vehicles, but successfully reducing GHG emissions will depend on fuel companies providing renewable biofuels and consumer demand for the vehicles and fuels.
3. Future developments in technologies, ever-changing markets, consumer demand and political uncertainties require flexible solutions. The business strategies that Ford implements, and the public policies that we encourage, must have the flexibility to meet a range of potential scenarios.
4. Early affordable steps to reduce GHG emissions from our products and processes may delay the need for drastic and costly reductions later. Lack of agreement on long-term solutions cannot be used as an excuse to avoid near-term actions.

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Climate Change-Related Commitments and Progress

Commitment [1]	Target	Progress
Products		
Ford U.S. and EU new products	Reduce CO_2 emissions by 30 percent by 2020, relative to a 2006 model year baseline	On track
Australian Industry-wide National Average CO_2 Emissions (NACE), previously known as National Average Fuel Consumption (NAFC) (industry)	Voluntary target to achieve national average CO_2 emissions of 222 g/km for light vehicles under 3.5 tonnes gross vehicle mass by 2010. Requires an overall reduction in average CO_2 emissions of 12% between 2002 and 2010	On track
Canadian Greenhouse Gas Memorandum of Understanding (industry)	Industry-wide voluntary agreement to reduce GHGs from the Canadian car and truck fleet by 5.3 megatonnes by 2010 compared to projected emissions	On track
Operations		
Global manufacturing energy efficiency (Ford)	Improve energy efficiency by 9% between 2006 and 2009, following an improvement of 22% from 2000 to 2006	Achieved
UK Emissions Trading Scheme (Ford)	UK operations to achieve a 5% absolute reduction target over the 2002–2006 timeframe based on an average 1998–2000 baseline. Program concluded in 2007	Achieved
EU Emission Trading Scheme (Ford)	Ensure compliance with European Union CO_2 Emission Trading Scheme requirements annually, including third-party verification	Achieved
Chicago Climate Exchange (Ford)	Reduce North American facility emissions by 6% between 2000 and 2010 as verified by third-party auditors	On track
Alliance of Automotive Manufacturers (industry)	Reduce U.S. facility GHG emissions by 10% per vehicle produced between 2002 and 2012	On track
Voluntary GHG Reporting (Ford)	Voluntarily report facility CO_2 emissions to national emissions registries in Australia, Canada, Mexico, the Philippines and the United States	Achieved

KEY: ACHIEVED, ON TRACK

1. The performance of Ford brands in Europe against the 1995 baseline for the voluntary European Automobile Manufacturers Association CO_2 commitment is shown in the data overview. The agreement was supplanted in late 2008 by new legislative initiatives discussed in the Climate Change Policy section.

Sustainable Technologies and Alternative Fuels Plan

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Our Sustainable Technologies and Alternative Fuels Plan details the near-, mid- and long-term steps we are taking to develop and deploy vehicle and fuel technologies to implement our blueprint for sustainability and meet our CO_2 reduction goal. Our plan includes steps to improve the fuel economy of traditional gas engines and a strategy to implement alternative fuels and powertrain technologies.

Improving Fuel Economy

This section outlines our plans for improving the fuel economy of traditional gas and diesel engines. These actions include implementing advanced engine and transmission technologies, weight reductions and aerodynamics improvements, as well as increasing the efficiency of vehicle sub-systems.

READ MORE

Migration to Alternative Fuels and Powertrains

Our plans for migrating to alternative fuels and powertrains include implementing vehicles that run on renewable biofuels, increasing advanced clean diesel technologies, increasing our hybrid vehicle applications and introducing battery electric vehicles and plug-in hybrids. We are also working to advance hydrogen internal-combustion engine and hydrogen fuel cell vehicle technologies.

READ MORE

Improving Fuel Economy

2007	2011	2020 2030
NEAR TERM Begin migration to advanced technology	MID TERM Full implementation of known technology	LONG TERM Continue to leverage advanced fuel-efficiency technologies and increase deployment of alternative powertrains and energy sources
▪ Significant number of vehicles with EcoBoost™ engines	▪ EcoBoost engines available in nearly all vehicles	▪ Increase percentage of internal combustion dependent on renewable fuels
▪ Dual clutch and 6-speed transmissions begin replacing 4- and 5-speeds	▪ 6-speed transmissions full implementation	
▪ Electric power steering ▪ Introduction of battery management systems	▪ Electric power steering full implementation	
▪ Increased unibody applications ▪ Introduction of additional small vehicles	▪ Weight reduction of 250–750 lbs ▪ Engine displacement reduction facilitated by weight savings	
▪ Aerodynamic improvements	▪ Additional aerodynamics improvements	

For more information about each of the fuel efficiency technologies listed in the chart above, please click on it in the list below.

show all | hide all

EcoBoost

The centerpiece of our near-term fuel-economy improvement efforts is the EcoBoost engine, which uses turbocharging, direct injection and reduced displacement to deliver significant fuel-efficiency gains without sacrificing engine power or performance. EcoBoost engines improve vehicle fuel economy up to 20 percent and reduce CO_2 emissions up to 15 percent compared to larger-displacement engines[1].

EcoBoost is also more affordable than many other fuel-efficiency technologies. Vehicles equipped with EcoBoost will have a significantly lower purchase price than vehicles with clean diesel or hybrid technologies, which means that customers will be able to pay back their investment in EcoBoost through fuel savings more quickly. Because of EcoBoost's relatively low cost – and its compatibility with most of the gas-powered vehicles we produce – we will be able to spread EcoBoost's fuel-economy benefits throughout our product lineup and to more of our customers more quickly.

EcoBoost will be introduced on the V-6 models of the 2010 Lincoln MKS, Lincoln MKT, Taurus SHO and Ford Flex. Thanks largely to the EcoBoost technology, both the V-6 Flex and the V-6 MKT are among the leaders in fuel economy in their respective segments. By 2013, Ford expects to sell approximately 1.3 million vehicles per year globally containing EcoBoost V-6 and I-4 engines, and in North America, 90 percent of Ford's nameplates will offer the technology.

PowerShift Transmission

To further improve the fuel economy of our vehicles, we are implementing a dual-clutch transmission system. This technology, called PowerShift, combines manual and automatic transmission technologies to deliver the fuel efficiency of a manual with the driving ease of an automatic. PowerShift uses six speeds instead of the four or five on most automatics, which further increases fuel efficiency. PowerShift technology will increase fuel efficiency by up to nine percent compared to traditional automatic transmissions, depending on the application. A "wet clutch" version of this technology has already been implemented in Europe on the Ford C-MAX 2.0-liter Duratorq TDCi diesel and the Volvo C30, S40 and V50 diesel models. A "dry clutch" version will be introduced globally in 2010 on the all-new Ford Fiesta and on the Ford Focus. The dry clutch version gets even better gas mileage and is more durable. Unlike wet clutch systems, it does not use an oil pump or torque converter, making the system more efficient, more durable and up to 30 pounds lighter than a traditional four-speed automatic transmission. We plan to offer advanced six-speed transmissions, both PowerShift and regular six-speed technology, on 100 percent of our new vehicles by 2013.

Weight Reductions

We are also working to improve fuel economy by decreasing the weight of our vehicles. For example, we are increasing our use of unibody vehicle designs, which reduce weight by eliminating the need for extra body framing used in truck-based products. Unibody-based crossover products provide many of the benefits of truck-based SUVs, such as roominess, all-wheel drive and higher stance, while significantly reducing total vehicle weight. The Ford Edge and Lincoln MKX crossovers are examples of our lightweight unibody designs.

Other weight-reduction plans include the use of lighter-weight components. For example, the EcoBoost engine technology allows us to use a smaller, lighter engine system while delivering more power and better fuel economy. Similarly, the dual-clutch PowerShift system weighs up to 30 pounds less than the four-speed automatic transmission it is replacing. We are also using lighter-weight materials, such as aluminum, magnesium, natural fiber and nano-based materials, which can reduce the weight of our vehicles by 250 to 750 pounds, without compromising vehicle size, safety, performance or customer-desired features. For example, the 2010 Lincoln MKT crossover has an advanced magnesium and aluminum liftgate. Please see the Environment section for further information on materials-based weight reductions.

Aerodynamics

We are also improving vehicle aerodynamics to improve fuel economy. We are using advanced computer simulations and wind tunnel testing to develop vehicle designs with up to five percent better fuel economy. We improved the fuel efficiency of the Ford Focus ECOnetic model, for example, by lowering the vehicle, adding an aerodynamics kit and using low-rolling-resistance tires. Similarly, the 2009 Ford Flex is among the most aerodynamic in its class, and we improved the aerodynamics of the 2009 Ford Escape by six percent over the previous models. Through a combination of aerodynamics and other fuel-economy improvements, we improved the fuel efficiency of the entire 2009 F-150 lineup by an average of eight percent. We also introduced an F-150 Special Fuel Economy edition that delivers 21 miles per gallon (mpg) in highway driving; a 12 percent improvement over previous models and best-in-class fuel economy for full-size pickup trucks.

Vehicle Sub-Systems Efficiencies

We are also improving the efficiency of every vehicle subsystem that affects fuel economy. For example, we are phasing in Electric Power Assisted Steering (EPAS) technology, which typically will improve fuel economy by 0.09 to 0.17 gallons per 100 miles and will decrease CO_2 emissions by up to 3.5 percent over traditional hydraulic systems, depending on the vehicle and powertrain application. We initially implemented this technology in North America on the 2008 Ford Escape and Mercury Mariner gasoline and hybrid vehicles. By combining EPAS with aerodynamics improvements, we improved the gas mileage of these vehicles by approximately eight percent compared to the previous model year. For 2009, we added EPAS to the Ford Fusion and Mercury Milan. In Europe, we introduced EPAS on the new Ford Fiesta, which launched in the summer of 2008, and the new Ka, launched in February 2009. On the 1.4-liter Duratorq Diesel Fiesta, EPAS provides a three to four percent improvement in fuel efficiency. Ultimately, we will introduce EPAS into all of our passenger cars and light-duty vehicles. The next implementation of the technology is scheduled for the Ford Flex and Lincoln MKS with the EcoBoost engine in 2009. In 2010 and 2011, we will introduce EPAS on the Ford Focus, Mustang, Taurus, Explorer and F-150.

Electrical Systems

Electrical Systems is another area in which we are making progress. By reducing vehicle electricity loads and increasing the efficiency of vehicle electrical systems, we can improve fuel efficiency. Our forthcoming Battery Management Systems (BMS), for example, will control the power supply system (in particular the alternator) to maximize the overall efficiency of the electrical system and reduce its negative impacts on fuel economy. This is accomplished by maximizing electricity generation during the most fuel-efficient situations, such as during vehicle deceleration. In less fuel-efficient situations, the alternator's electricity generation is minimized to meet in-vehicle electrical requirements like entertainment systems. BMS will be introduced in Europe soon and on the Ford Edge in North America in 2011. We have also introduced more efficient alternators, which improve fuel economy.

Aggressive Deceleration Fuel Shut-Off

We are also deploying Aggressive Deceleration Fuel Shut-Off (ADFSO) technology to improve fuel efficiency. ADFSO allows fuel supply to the engine to be shut off during vehicle deceleration and then automatically restarted when needed for acceleration or when the vehicle's speed approaches zero. This new system builds on the Deceleration Fuel Shut-Off technology available in our existing vehicles by extending the fuel shut-off feature to lower speeds and more types of common driving conditions, without compromising driving performance or non-CO_2 emissions reductions. This improved fuel shut-off will increase fuel economy by an average of one percent. An additional benefit of the ADFSO technology is increased deceleration rates, which should extend brake life and improve speed control on undulating roads. This technology was implemented in mid-2008 on the new Ford Flex and the Lincoln MKS and in late 2008 on the 2009 model year Ford F-150, Ford Expedition and Lincoln Navigator regular and extra-long models, as well as the Ford Escape and Mercury Mariner. In the next two to three years we plan to implement this technology on as many vehicles as possible, beginning with front-wheel-drive, six-speed-transmission vehicles.

Stop/Start

We are developing a "stop/start" technology that shuts down the engine when the vehicle is stopped and automatically restarts it before the accelerator pedal is pressed to resume driving. This technology will maintain the same vehicle functionality as a vehicle without the technology, but it will improve city driving fuel economy by up to six percent. Stop/start technology includes sensors to monitor functions such as cabin temperature, power supply state and steering input, so that vehicle functioning remains exactly the same to the driver as when the engine remains on continuously. If the system senses that a vehicle function has been reduced and will negatively impact the driver's experience, the engine will restart automatically. Start/stop technology is already being used in our hybrid vehicles and will eventually provide a cost-effective way to improve fuel efficiency on a large volume of non-hybrid vehicles. In the U.S. we are planning to introduce the technology into non-hybrid, automatic transmission vehicles by the 2012 model year, and in Europe in manual transmission vehicles by the 2010 model year. By 2016, 90 percent of our vehicle nameplates will be equipped with stop/start technology.

Smaller Vehicles

Smaller vehicles provide consumers with another way to get better fuel economy. We are planning to launch additional small cars, commonly referred to as "B-cars." These include the all-new Ford Fiesta, which was introduced in Europe in 2008 and will be available in Asia, South Africa, Australia and the Americas by 2010.

1. When fuel economy is calculated as miles per gallon, EcoBoost delivers up to 20 percent better fuel economy compared to larger displacement engines. When fuel economy is calculated in liters per 100 km, as it is in most of Europe, EcoBoost delivers up to 15 percent better fuel economy. The benefits of EcoBoost are the same in each case; the difference is only in the units used in the calculations. This is because the conversion between miles per gallon, which measures distance traveled per unit of fuel consumed (wherein more is better), and liters per 100 km, which measures fuel consumed per unit of distance traveled (wherein less is better) is a reciprocal or inverse proportion. Therefore, the resulting figures are different even though the actual benefit received is the same.

Migration to Alternative Fuels and Powertrains

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2007	2011	2020 – 2030
NEAR TERM Begin migration to advanced technology	MID TERM Full implementation of known technology	LONG TERM Continue deploying advanced powertrains and alternative fuels and energy sources

- Advanced Clean Diesel (2007 – 2020)
- Hybrid Electric Vehicles (HEVs) (2007 – 2030)
- Battery Electric Vehicles (BEVs)
- Plug-in Hybrid Electric Vehicles (PHEVs)
- Renewable/Biofueled Vehicles (2007 – 2030)
- Hydrogen Internal Combustion Engines (H_2ICEs) (2020 – 2030)
- Hydrogen Fuel Cell Vehicles (FCVs) (2020 – 2030)

For more information on our plans to advance alternative fuels and powertrain technologies, please click on the bar for each fuel or technology in the graphic above.

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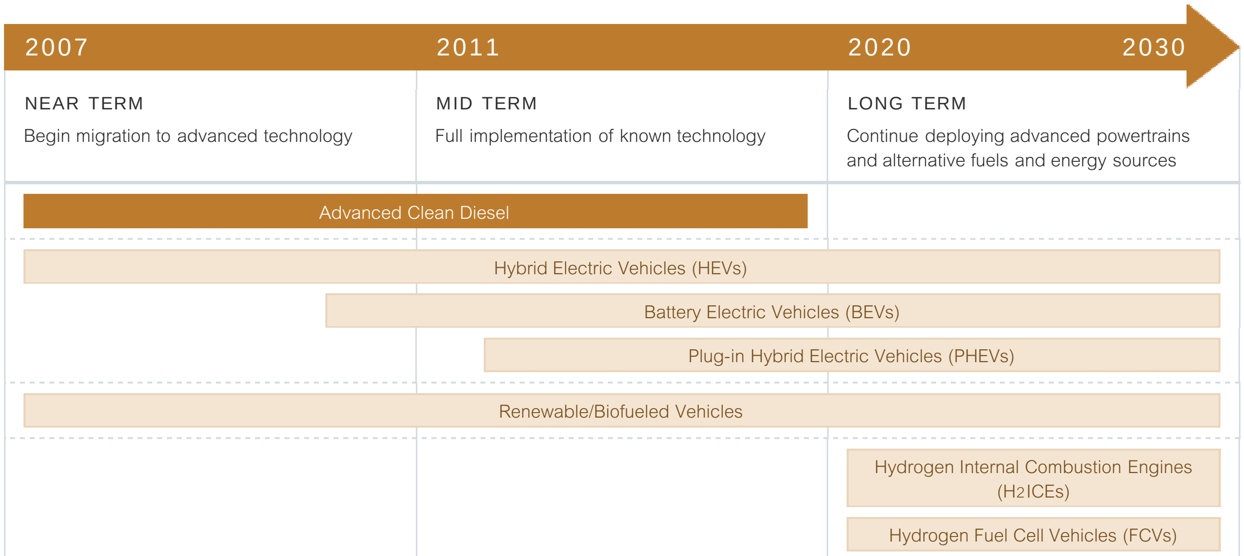
Migration to Alternative Fuels



Advanced Clean Diesel

Modern diesels offer some significant advantages over traditional gasoline engines. They consume 30 to 40 percent less fuel, and on a well-to-wheels basis they emit 15 to 30 percent less CO_2.[1] In addition, direct-injection diesel engines provide exceptional power and torque, resulting in better driving performance and towing capabilities.

In Europe, diesel-powered vehicles account for more than 50 percent of new vehicle sales and make up approximately 30 percent of the total vehicle fleet on the road. Ford continues to improve its strong lineup of fuel-efficient and clean diesel vehicles in Europe. In 2008, for example, we introduced the Ford Fiesta ECOnetic, which gets more than 62 mpg (approximately 78 mpg in European Imperial gallons)[2] and emits just 98 g/km of CO_2. This vehicle is powered by a specially calibrated version of the 90 PowerShift 1.6-liter Duratorq TDCi, combined with a coated diesel particulate filter.

In North American markets, diesels all but disappeared in the passenger vehicle market years ago because the diesel engines available at that time were not as clean or smooth running as gasoline engines. With the phasing-in of cleaner diesel fuels in 2007 and advances in clean diesel technology, there is new opportunity for the expanded use of diesel technologies in North America. Ford engineers are developing next-generation diesel technologies that will maintain the fuel economy advantages of diesels while minimizing emissions to meet strict U.S. air pollution standards. These technologies include diesel particulate (soot) filters and NOx reduction catalysts, along with advanced combustion systems that will significantly reduce the particulate matter and NOx emissions associated with diesel engines. These advances will provide another route to more fuel-efficient and cleaner mobility.

In 2008, Ford introduced a new generation of cleaner, quieter diesel engines in the Ford F-series Super Duty line of pickup trucks. The new 6.4-liter PowerStroke diesel is Ford's cleanest, quietest diesel pickup ever, with particulate emissions equivalent to a gasoline engine. It is the first Ford pickup in North America to use a high-precision, common-rail fuel-injection system featuring piezo-electric injectors, which use a stack of over 300 wafer-thin ceramic platelets to control the fuel injector nozzle allowing it to operate faster than other electro-mechanical fuel injectors to decrease fuel consumption and reduce emissions.

Ford Super Duty products in North America are also currently approved to use B5 fuel, which is composed of five percent biodiesel and 95 percent petroleum diesel. Biodiesel is a renewable fuel made from soybean oil and other fats. Ford is continuing to work with North American biodiesel industry trade groups to establish biodiesel fuel quality standards that will allow the use of up to B20 (fuel containing 20 percent biodiesel, 80 percent petroleum diesel) in future model years. In Europe, our vehicles are also compatible with B5, and we are working with European fuel standards organizations to establish fuel-quality standards for biodiesel blends greater than B5. The use of biodiesel helps reduce dependence on foreign oil and reduces life-cycle CO_2 emissions. For more information on biofuels please see the Renewable Biofueled Vehicles section.

1. Values based on J.L. Sullivan, R.E. Baker, B.A. Boyer, R.H. Hammerle, T.E. Kenney, L. Muniz, and T.J. Wallington, 2004, CO_2 Emission Benefit of Diesel (versus Gasoline) Powered Vehicles, ***Environmental Science and Technology***, 38: 3217-3223.
2. ECOnetic vehicles are only available in Europe. These fuel economy calculations are based on European Fuel Economy Directive EU 93/116/EEC, which uses European drive cycles. They differ from fuel economy calculations developed in the U.S. or other regions of the world.

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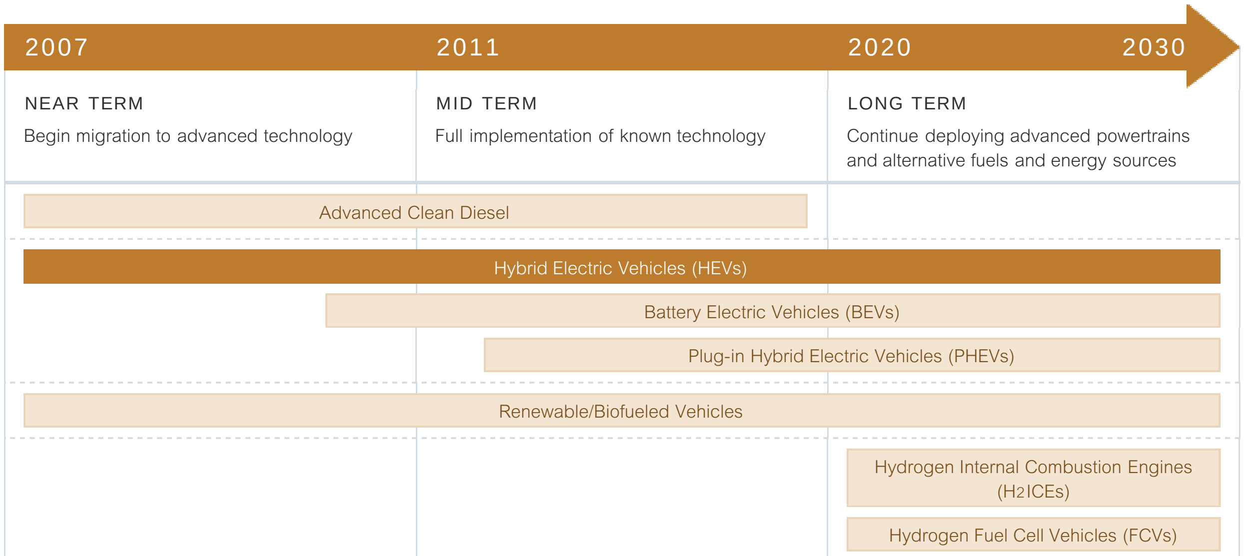


Hybrid Electric Vehicles (HEVs)

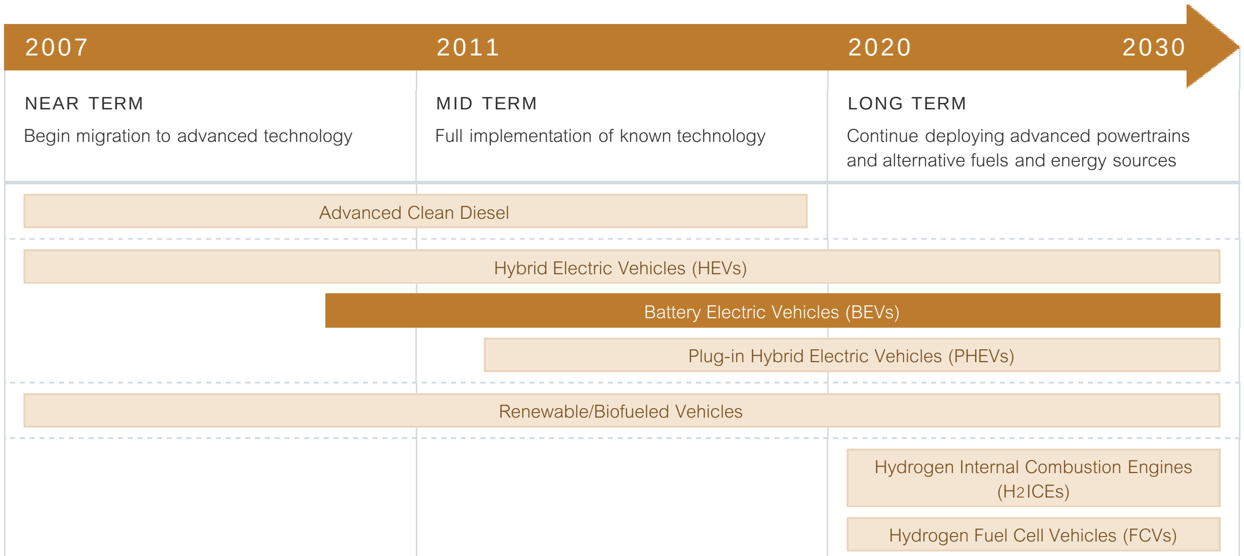
Ford introduced the world's first hybrid SUV in 2004, the Ford Escape Hybrid. We followed up with the Mercury Mariner Hybrid in 2005 and the Mazda Tribute Hybrid in 2007. The Ford Fusion and Mercury Milan Hybrids started being sold in early 2009. All of these vehicles are full hybrids, meaning they can run exclusively on battery power, exclusively on gas power or on a combination of both. As of early 2009, we had produced more than 100,000 hybrids worldwide. We are currently increasing our hybrid volume, targeting a cost reduction of more than 30 percent and preparing for hybrid capability across our global products platforms.

The Ford Fusion Hybrid has an Environmental Protection Agency rating of 41/36 mpg city/highway, making it the most fuel-efficient midsize sedan in the United States today. The Fusion Hybrid's fuel economy significantly exceeds that of its nearest midsize competitor, and it can go more than 700 miles on a tank of fuel. It includes an innovative new SmartGauge™ with EcoGuide that coaches hybrid drivers to maximize fuel efficiency. With the Fusion and Milan Hybrids, we are doubling the number and volume of our hybrid lineup in the U.S.

In 2012 we will deliver our next-generation hybrid vehicles. The next-generation system, already under development, will be even more efficient and more cost-effective than the current system and will use lithium-ion battery cells.

Ford is also working on hybrid applications specifically designed for our European customers. Because the diesel market is highly developed in Europe and driving patterns there differ significantly from the U.S., certain technical elements of hybridization are better for European applications than full hybrids. We have determined that "micro-hybrids," which combine stop/start systems with a smart regenerative-braking charge, are one of the most efficient ways to use hybrid technologies to enhance fuel efficiency in the European market. Micro-hybrids cannot drive on electric power alone nor use battery power to support the combustion engine. Instead, the stop/start system shuts off the engine at every stop, providing considerable fuel savings, especially in city driving conditions. And, the micro-hybrid powertrain system converts some braking energy into electrical energy. This supports the alternator in charging the battery and reduces fuel consumption. In the European driving environment, micro-hybrids that build on diesel technology may offer the best combination of performance, fuel economy and affordability. Ford has already demonstrated micro-hybrid technology in prototypes in recent years.

Migration to Alternative Fuels



Battery Electric Vehicles (BEVs)

Ford has announced an expanded, comprehensive electric vehicle strategy aligned with growing public interest in advanced technologies that can help reduce the use of gasoline. We are employing a comprehensive approach to electrification that will tackle commercial issues such as batteries, standards and infrastructure. Strategic partnerships are an important part of this new approach. We are working with partners to develop and produce batteries, infrastructure and government policy to speed the commercialization and acceptance of electric vehicles. This global electrification strategy is not a test program. It is a vital element of our business plan going forward and is aimed at making Ford a leader in sustainable transportation.

BEVs do not have an internal-combustion engine and do not use any onboard gasoline. Instead, they use a high-voltage electric motor, which takes its power from a battery pack charged by plugging into a standard 110-volt or 220-volt outlet in the U.S., or a 230-volt outlet in Europe. Our early BEV test vehicles charge in six hours when plugged into a 220-volt outlet. The production models will be rechargeable in six hours from 230- and 220-volt outlets or 12 hours from a 110-volt outlet. As reliable and durable fast-charge technology becomes available, Ford's BEVs will be designed to take advantage of this capability.

In 2010, we will deliver a BEV version of our Transit Connect commercial utility van for use by fleet customers in the U.S. This vehicle is being developed in partnership with Smith Electric Vehicles, the European market's leading battery electric upfitter of commercial vehicles and part of the UK-based Tanfield Group. In 2011 we will deliver a BEV small sedan in partnership with Magna International, which will be aimed at U.S. retail customers. This car will be based on our new global Focus-sized platform and will have a driving range of up to 100 miles on a single charge of its lithium-ion high-voltage battery. We are targeting urban markets with this vehicle and expect to sell between 5,000 and 10,000 units annually to start. We will be ready to ramp up to higher volumes as the infrastructure develops and customer demand grows.

In addition to this work in the U.S., Ford is collaborating with Tanfield, the market leader for electric vehicles, to offer battery-electric versions of the Ford Transit and Transit Connect commercial vehicles to fleet customers in the UK and European markets.

Ford's aggressive new electrification plan represents the next step in the Company's sustainability plan. The plan includes a commitment to greater vehicle fuel economy and lower CO_2 emissions as part of Ford's longer-term commitment to addressing climate change and energy security.

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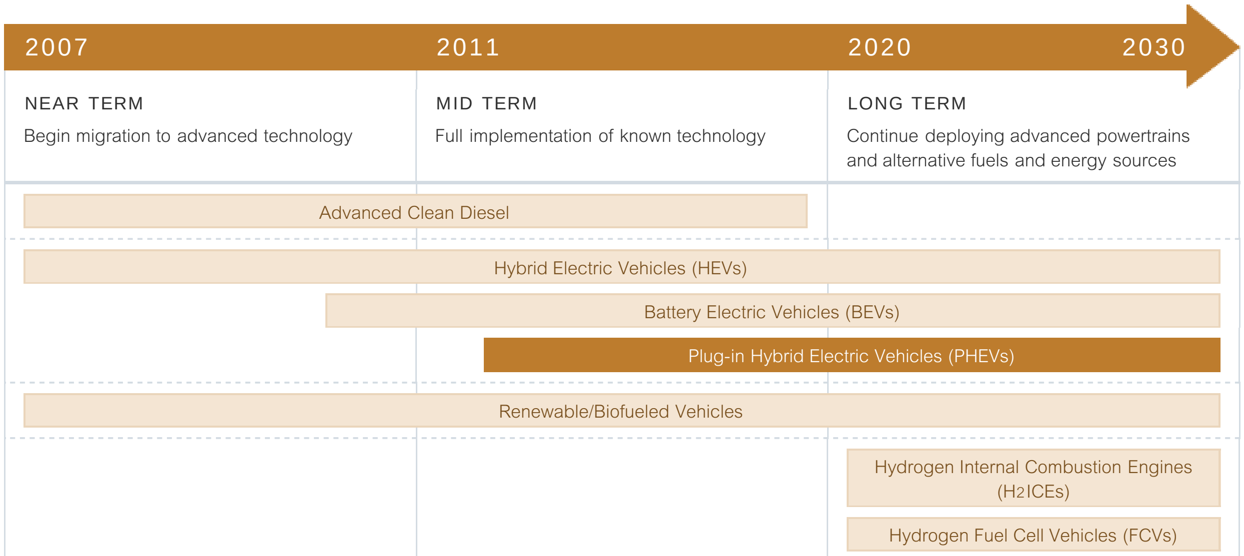


Plug-in Hybrid Electric Vehicles (PHEVs)

We are currently developing and testing plug-in hybrids in preparation for bringing them to market in 2012. PHEVs are similar to HEVs in that they are equipped with both an electric battery and a gas-powered engine. Unlike today's hybrids, however, PHEVs are equipped with a high-capacity battery that can be charged from an ordinary household socket. In addition, while regular HEVs maintain a roughly constant battery charge, plug-in hybrids discharge the battery while driving to provide additional fuel savings. PHEVs have the potential to reduce tailpipe emissions to near zero when running on battery power. However, the vehicle's overall life-cycle emissions depend on the electrical power source. PHEVs could be significantly less expensive for consumers to operate because they allow drivers to travel on grid-based electricity stored in batteries instead of more costly gasoline.

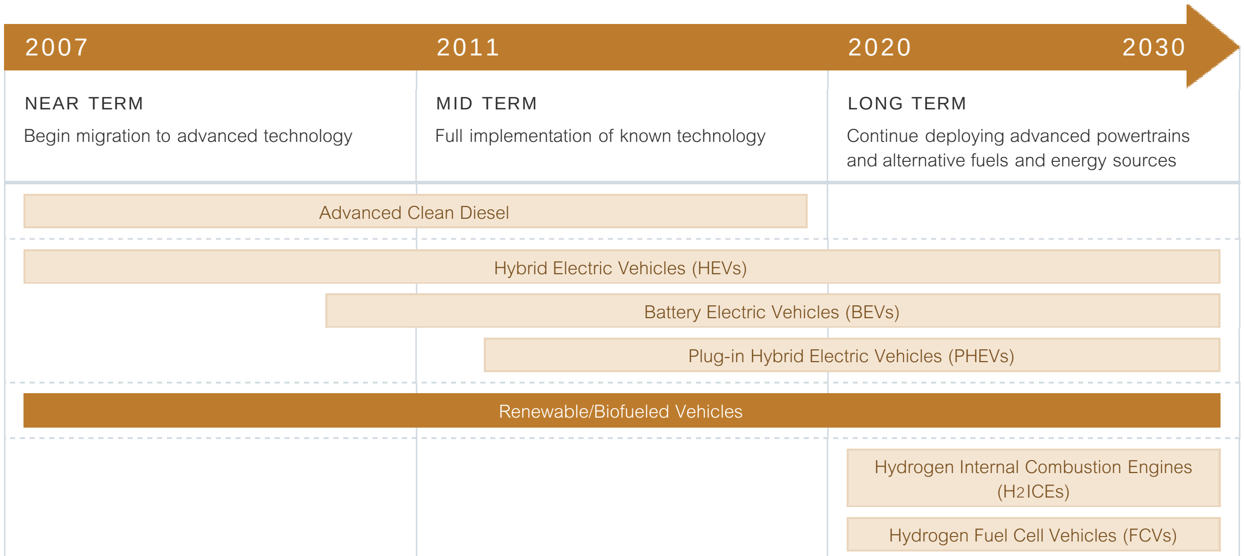
In 2007, Ford committed to a collaborative project with Southern California Edison to develop a fleet of plug-in hybrid vehicles as part of a PHEV demonstration project. The project seeks to provide real-world usage data and to understand critical implementation issues, including the vehicle-utility interface, the impact of plug-ins on utility operations and emissions, and the value to users, utility companies and vehicle manufacturers. Since the project began, numerous organizations have joined the partnership and helped to evaluate our PHEVs in different geographical locations. These partners include the Electric Power Research Institute, the New York State Energy Research and Development Authority and utilities including American Electric Power, ConEdison, DTE Energy, National Grid, New York Power Authority, Progress Energy and Southern Company-Alabama Power.

In 2008, Ford also announced a program with the U.S. Department of Energy (DOE) to identify a sustainable pathway toward accelerated, successful mass production of plug-in hybrid electric vehicles. The program includes a three-year demonstration project with a vehicle fleet deployed by DOE and energy partners to collect real-world battery performance data and evaluate PHEV and grid performance. Ford was awarded a $10 million contract by DOE in support of this work. Ford has already deployed 10 vehicles with its utility partners and DOE, and is scheduled to deploy an additional 10 in 2009. The PHEV demonstration fleet uses a blended, or parallel, hybrid configuration. Parallel hybrids can be propelled by an electric motor, a gasoline internal combustion engine, or both together. This parallel system enables flexibility and efficiency in battery sizing while maximizing battery life and investment. Initial field data shows significant improvements in fuel economy – possibly up to 120 mpg when vehicles are operated with a charged high-voltage battery – and the potential for reduced emissions.

Ford's PHEV demonstration fleet vehicles use advanced lithium-ion batteries supplied by Johnson Controls-Saft. In February 2009, we announced the continuation of our partnership with Johnson

Controls-Saft to develop an advanced lithium-ion battery system to power our first commercial plug-in hybrid. We plan to have a plug-in hybrid vehicle available commercially in 2012, as part of our overall plan for vehicle electrification.

Migration to Alternative Fuels



Renewable/Biofueled Vehicles

Current Generation Biofuels

Ford has a long history of developing vehicles that run on renewable biofuels. We produced the first flexible fuel vehicle approximately 100 years ago: a Model T capable of running on gasoline or ethanol. Since 1997, we have offered flexible fuel vehicles (FFVs) capable of running on gasoline or E85 ethanol – a blended fuel that contains up to 85 percent ethanol and at least 15 percent petroleum-based gasoline. To date, we have more than 4 million E85-capable vehicles on the road, including more than 2.5 million in North America and 1.8 million in Brazil. In 2007 alone, we introduced approximately 300,000 FFVs in North America. In Europe, Ford is a market leader and pioneer in bio-ethanol-powered FFVs, with nearly 65,000 vehicles delivered to customers since 2001. Ford FFV models are now available in 17 European markets, with Sweden, Germany, the Netherlands, Spain and France showing the strongest demand.

Globally, Ford currently offers 19 models in the United States, Europe, Asia and South America that can run on E85. These include the Ford Crown Victoria, Mercury Grand Marquis, Lincoln Town Car, Ford Fusion, Mercury Milan, Lincoln Navigator, Ford Expedition, Ford Econoline and Ford F-150 in North America; the Volvo XC60, Ford Mondeo, S-MAX, C-MAX, Focus and Galaxy in Europe; the Ford Fiesta, EcoSport and Focus in Brazil; and the Ford Focus in Thailand.

Next-generation Biofuels

We are continuing to develop the next generation of biofueled vehicles, including vehicles capable of running on advanced biofuels. Our current research focuses on two primary biofuels: bio-ethanol and biodiesel. Bio-ethanol (used for example in E85) is a gasoline alternative derived from plant material. Most bio-ethanol in the United States is made from corn. In other parts of the world it is made from other locally available crops, including sugar cane in Brazil and sugar beets in Europe. All modern gasoline vehicles can run on E10, a gasoline/bio-ethanol mixture of up to 10 percent by volume bio-ethanol.

Biodiesel is a diesel alternative made from vegetable oils obtained from oil seeds, including soy, canola, palm and rapeseed, or from animal fat. In the United States, most biodiesel is currently made from soybeans. In the U.S. and Europe our diesel vehicles can run on B5, a blend of five percent biodiesel and 95 percent petroleum diesel. We are working with fuel standards organizations to allow the use of biodiesel blends of greater than B5 in our future products.

Bio-ethanol, biodiesel and other renewable fuels have significant advantages. They can be made with locally available raw materials, reducing the need for foreign-supplied oil while increasing energy security, and they produce fewer lifetime CO_2 emissions. However, important issues remain regarding biofuels' energy density, the best way to use these fuels to reduce greenhouse gas (GHG) emissions, and their ability to meet fuel needs without diminishing food supplies. (These issues are discussed in more detail later in the Biofuel Challenges section.)

Ford is working to support and promote the next generation of biofuels, including cellulosic biofuels. These are fuels made from plant cellulose – stalks, leaves and woody matter – instead of from sugars, starches or oil seeds. Cellulosic biofuels have many advantages. They minimize possible market competition between food and fuel. They allow more efficient use of crops such as corn and soybeans by using more of the plant. In addition, cellulosic biofuels can be made from crops that require less energy-intensive farming, such as switchgrass and wood, further reducing the total CO_2 footprint of fuels used for operating vehicles.

Biofuel Infrastructure

To make an impact on GHG emissions and energy security, biofuels must become more widely available. Ford has committed to doubling the number of FFVs in its lineup by 2010, and, if the market dictates, will commit to expanding FFV output to 50 percent of total vehicle production by 2012.

Ford is also working in Europe and other parts of the world to promote the use of biofuels. We are part of Bio-Ethanol for Sustainable Transport, or BEST, which focuses on increasing the use of ethanol. BEST pilot projects are planned or underway in the UK, Spain, Italy and the Netherlands. We are also supporting the PROCURA project, which is establishing test programs for ethanol, biodiesel and natural gas in Italy, Portugal, Poland, Spain and the Netherlands.

United States Renewable Fuel Standard and the Future of Biofuels

The Energy Independence and Security Act of 2007 established a new Renewable Fuel Standard (RFS) requiring a significant increase in the use of biofuels – up to 36 billion gallons per year by 2022. In addition, this law requires that by 2013 a certain portion of biofuels must be advanced and/or cellulosic-based fuels. Ethanol blended into gasoline is expected to supply a large percentage of this biofuel mandate and could displace nearly 20 percent of U.S. gasoline demand by 2022.[1] The use of biodiesel in the U.S. is also likely to increase in the coming years. However, it will not likely increase to the same levels as ethanol, because the RFS mandates lower volumes of biomass-based diesel and because a relatively small percentage of light-duty passenger vehicles in the U.S. use diesel.

Using low-level ethanol blends such as E10, which is the current compatibility limit for all non-FFV light-duty vehicles, would achieve approximately 40 percent of the RFS-mandated biofuel use by 2022. Therefore, meeting the full RFS biofuel requirement will require the use of more E85-capable FFVs and/or the development of vehicles that can use mid-level blends of ethanol (i.e., between E10 and E85). Furthermore, a corresponding increase in the E85 fueling infrastructure in the next 10 to 20 years will be required. An approach using mid-level blends would require that all new vehicles be designed for higher ethanol capability, and the existing fueling infrastructure would need to be redesigned for higher ethanol compatibility. Regardless of the specific strategy used, coordinated efforts will be required between automakers, fuel suppliers, consumers and the government to meet the RFS mandate while ensuring the compatibility of vehicles and ethanol-blended fuel.

Biofuel Challenges

Much of the interest in biofuels results from their potential to lessen the environmental impacts of transportation fuels while contributing to energy independence. Biofuels are made from domestic and renewable resources, they provide an economic boost to farmers, and they help to reduce climate-change-causing greenhouse gas emissions because the plants from which they are made absorb CO_2 while they are growing. But are biofuels the solution to our growing fuel-related environmental, economic and political problems? The issues are complex. We believe biofuels are an important part of the equation for addressing climate change and energy security. We recognize, however, that major advances need to be made in production processes, source materials and fuel types in order to achieve the full promise of biofuels.

Some of the challenges relating to today's biofuels include the following:

- **Energy density**

  The energy density of ethanol is approximately two-thirds that of gasoline.[2] This means there is approximately one-third less energy in a gallon of ethanol than in a gallon of gasoline. As a result, drivers using blends with a high amount of ethanol will have to refuel more frequently to drive the same distance. Biodiesel has approximately the same energy density as conventional diesel.

- **Life-cycle greenhouse gas emissions**

  The plants used to produce biofuels capture as much carbon dioxide during their growth as they release when burned. However, current farming and production processes utilize fossil fuels in the production of bio-ethanol and biodiesel, so the production of these biofuels for use in vehicles results in a release of some fossil-fuel-based GHG emissions on a life-cycle basis. Recent studies have suggested that N2O emissions from fertilizers required to grow biofuel feedstocks may have been underestimated and that these emissions reduce the GHG benefits attributed to biofuels. We agree that N2O emissions from biofuel production need to be carefully considered for all different types of biofuel feedstocks and farming techniques on a full life-cycle basis, including allocation of emissions to co-products derived from biofuel production. We agree with government and academic studies that suggest that current E85 ethanol from corn results in 20 to 30 percent less life-cycle GHG emissions than today's gasoline, on an energy-equivalent basis. In addition, GHG emissions related to petroleum can vary greatly depending on the source. Producing crude oil from tar sands, for example, results in a greater release of GHGs than producing crude oil from conventional sources. The use of renewable fuels in the production of bio-ethanol and biodiesel production can reduce their life-cycle GHG emissions further. We believe that developing cellulosic or biomass-based biofuels with next-generation processes will significantly decrease GHG emissions associated with biofuels, perhaps by up to 90 percent.[3]

Competition with the food supply

Another concern about current corn- and soybean-based biofuels is that they compete in the marketplace with food supplies and increase food prices. Demand for corn used directly for human food (including high-fructose corn syrup) comprises less than 10 percent of the total corn supply. Approximately half of the corn produced in the U.S. is used for animal feed. In 2008, about 30 percent of the corn harvest in the U.S. was used to produce ethanol. The ethanol process removes only the starch from the corn – the remaining portion is a highly valued feed product (called distiller grains) and a good source of energy and protein for livestock and poultry. If next-generation biofuels can efficiently utilize biomass such as plant stalks, woodchips or grasses and be grown on marginal land with little irrigation, then competition with food crops should remain minimal.

Land use conversion for biofuel production

Recent studies have looked at the overall CO_2 and nitrous oxide (N2O) impacts of converting natural ecosystems to farmland for the production of biofuels. This is an important and complex issue. Converting natural lands to croplands for fuel production can lead to the release of carbon stored in above- and below-ground biomass. Releasing this carbon in the form of CO_2 during land conversion to energy crops creates a carbon "debt", which may take a very long time to repay through the greenhouse gas benefits of biofuel use. The use of degraded pastures or abandoned farmland, by contrast, rather than natural ecosystems, would incur minimal carbon debt, because there is limited CO_2 storage in these previously altered ecosystems. At Ford, we are following the debates about biofuels closely. As we proceed, we need to consider how biofuels are derived and carefully review issues such as the potential net greenhouse gas benefits; political, economic, social and environmental concerns related to biofuel and petroleum use; and the management of land, food and water resources. We agree with the general consensus among scholars and industry experts that the current generation of biofuels (e.g., corn-based bio-ethanol and soybean-based biodiesel) have modest environmental benefits and are a first step toward cleaner vehicles and energy independence. We are actively investigating next-generation biofuels that have greater environmental, energy security and economic benefits. We believe that improvements in the efficiency of farming technologies and biomass production processes, and the development of advanced biofuels, will significantly increase the benefits and long-term sustainability of biofuels. Even with these improvements, solving our climate change and energy security problems will require a multifaceted set of solutions, including new fuels, improvements in vehicle fuel economy and changes in consumer driving patterns and practices.

1. J.E. Anderson, R.E. Baker, P.J. Hardigan, J.M. Ginder, T.J. Wallington. In preparation. ***Energy Independence and Security Act of 2007: Implications for the U.S. Light-Duty Vehicle Fleet***.

2. J.B. Heywood, ***Internal Combustion Engine Fundamentals***, McGraw-Hill, New York 1988.

3. ***Ethanol: The Complete Energy Lifecycle Picture***, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy, March 2007.

Migration to Alternative Fuels

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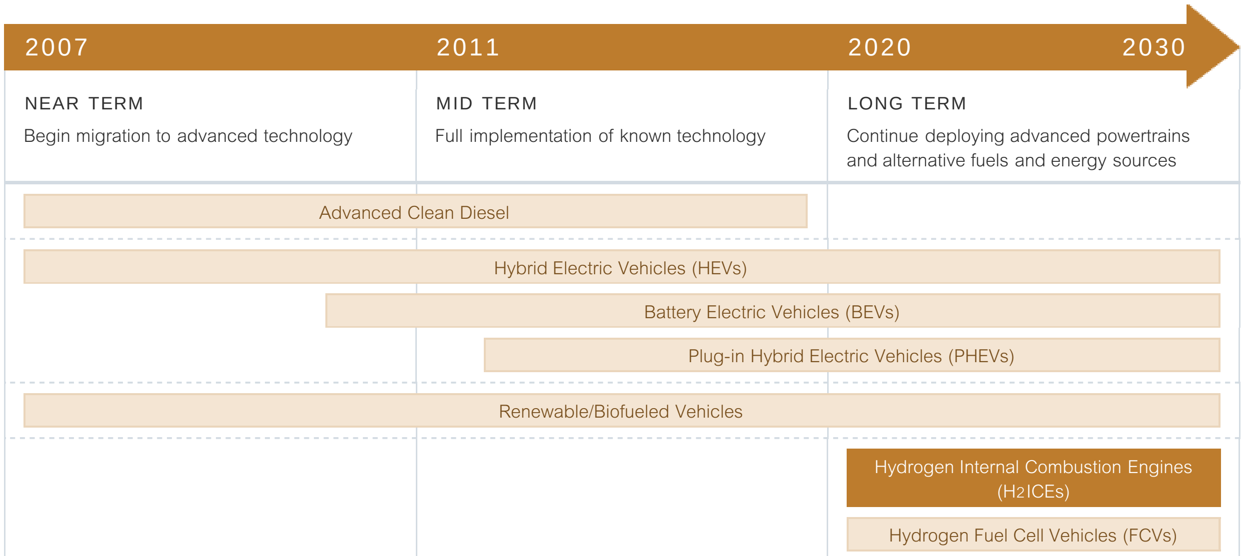

Hydrogen Internal Combustion Engines (H_2ICEs)

Ford was the first automaker to develop commercially available hydrogen-powered internal-combustion engines (H_2ICEs), which use the same basic technology as gasoline-powered engines but run on hydrogen fuel. We view this as a possible bridge technology to hydrogen-powered fuel cells, because it is less expensive than fuel cells and uses existing engine manufacturing capability.

We currently have a fleet of 30 E-450 H_2ICE shuttle buses on the road in North America. These E-450 shuttle buses use a 6.8-liter supercharged Triton V-10 engine with a hydrogen storage system equivalent to 29 gallons of gasoline. We have placed 10 of the H_2ICE shuttles with the Canadian government in Vancouver, Prince Edward Island, Ottawa and Toronto in support of their vision for a hydrogen-based economy. We also have buses on the road in Orlando, Las Vegas, Detroit, California, Missouri and Pennsylvania. As of April 2008, our H_2ICE fleet had successfully logged 200,000 miles in operation.

H_2ICEs still face considerable challenges. Like all hydrogen-powered vehicles, H_2ICEs are limited by fuel storage and fuel infrastructure issues and concerns about hydrogen safety. For example, current H_2ICE vehicles have a driving range of 150 to 200 miles, due to fuel storage limitations. H_2ICEs are also still very expensive. However, if these problems can be overcome, they have the potential to deliver significant environmental benefits including near-zero CO_2 and other tailpipe emissions and 13 percent better fuel economy than traditional vehicles.

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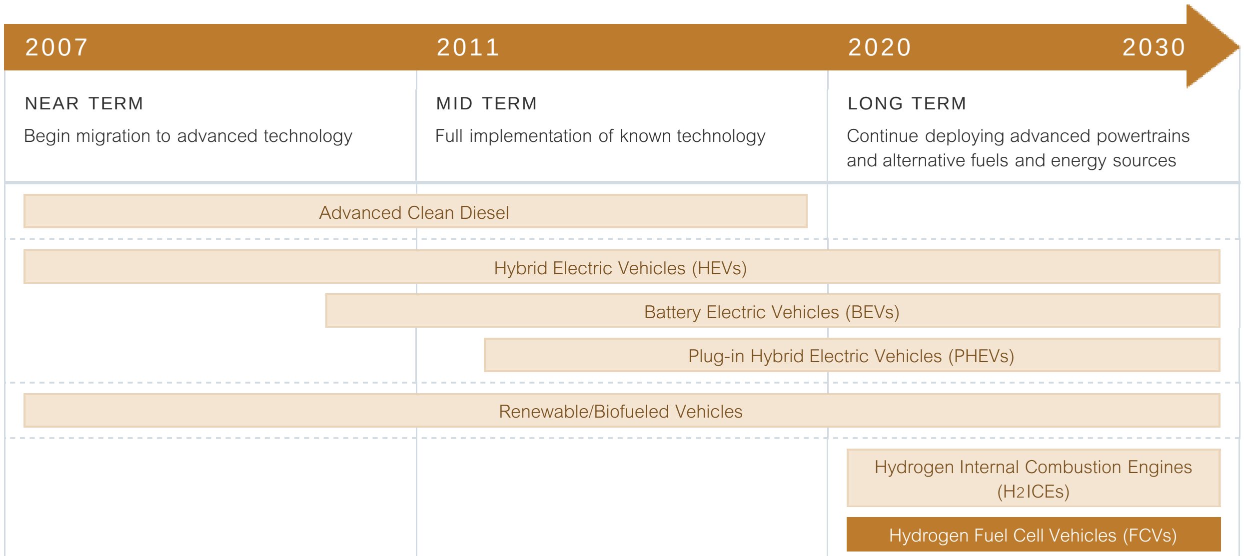

Hydrogen Fuel Cell Vehicles (FCVs)

Fuel cell vehicles, like battery electric vehicles, produce zero tailpipe emissions. Unlike BEVs, however, which must be recharged via an external power source, FCVs use an onboard fuel cell to create electrical power through a chemical reaction based on hydrogen fuel. Vehicles using fuel cells as the primary source of motive power can also be hybridized with a high-voltage battery, to improve vehicle performance and better optimize the cost and robustness of the fuel cell system.

We are continuing to develop and demonstrate hydrogen fuel cell technology with our Focus FCV test fleet. The Focus FCV uses Ballard fuel cell technology, called HyWay1, and is one of the industry's first hybridized fuel cell vehicles, meaning it has a hybrid battery system as well as a fuel cell system. A test fleet of 30 of our FCVs is currently in operation in cities throughout North America and Europe. In 2005, we placed Focus FCVs in Orlando, Sacramento, Southeast Michigan and Vancouver. In 2006, four more FCVs were placed in Berlin and Aachen, Germany, and in 2008 an FFV was placed in Iceland. Before being placed with commercial test fleets, these vehicles underwent an extensive and accelerated testing protocol to ensure they could last three years and 36,000 miles without incident. While on the road, the vehicles are providing important information about the performance of hydrogen FCVs in a wide range of driving and climate conditions. The total fleet has thus far accumulated more than 1,000,000 miles of real-world, on-road operation. The knowledge gained from this fleet will feed directly into Ford's future fuel cell research. Based on the knowledge gained from the Focus test fleet, we have completed development and lab validation of our new fuel cell technology, called HyWay2/3. This new technology improves the robustness and freeze start capability of the fuel cell propulsion system.

Even with the advances we have made in hydrogen technology over the past 10 years, we still have many challenges to overcome before hydrogen FCVs can compete in the market with current vehicle technology. The cost and durability of the fuel cell system are the most significant challenges. These problems remain too significant to allow for commercialization of FCVs at this point, even with the incremental improvements in the current state-of-the-art fuel cell.

The largest fraction of the cost of a fuel cell system is the fuel cell stack. We are therefore pursuing fundamental research into ways to achieve a significant reduction in the cost of this component. These research and development efforts include work on fuel cell catalysts to reduce the precious metal loading of the electrodes and alternatives to replace expensive materials. Simultaneously, we are working to increase power density, in order to improve the utilization of expensive materials. The components surrounding the power generation system, such as the air compressor and hydrogen recirculation pump, are also responsible for a large fraction of the cost of the fuel cell system. These technologies are relatively mature, however, which makes it difficult to achieve significant cost reductions. Simplification of the fuel cell stack power generation system may thus provide the best opportunity to reduce the overall cost of a fuel cell system. Materials development is crucial to our ability to optimize fuel cell stack operating conditions and reduce system complexity.

We are also working to improve fuel cell durability and the robustness of fuel cell materials under real-world usage. To this end, we are conducting extensive research on materials characterization and design optimization to help achieve robustness targets. For example, we are developing advanced analytical tools and modeling capability, including molecular dynamics. These analysis and modeling tools will help us acquire the information we need to improve our understanding of performance degradation and failure modes. As part of this effort, Ford is reprioritizing its resources to concentrate on fundamental fuel cell technology research, rather than demonstration vehicles. The key focus for this research is to significantly reduce costs and improve durability, in order to enable commercialization.

Hydrogen storage onboard the vehicle is another critical challenge to the commercial viability of hydrogen FCVs. We recognize that compressed hydrogen storage, which is currently used in the demonstration vehicles, may not be sufficient to achieve commercialization goals. We are therefore pursuing research on materials-based onboard hydrogen storage technology, including complex hydride and novel hydrogen sorbent technologies, which show technical potential.

Producing and distributing hydrogen fuel is another important hurdle on the road to implementing hydrogen-powered FCVs. As there is no widespread hydrogen fueling system, new infrastructure must be designed and executed throughout the country.

Working alone, Ford will not be able to overcome all of the challenges hydrogen vehicles face. That is why Ford is collaborating with a wide range of partners on the development of hydrogen vehicles, fuels and fueling systems. These partners include:

- The Freedom CAR and Fuel Partnership: a partnership between Ford, General Motors, Chrysler, five energy providers and the U.S. Department of Energy to develop vehicles and fuels that will provide freedom from imported oil and carbon-based fuel emissions, and
- The Clean Energy Partnership; a consortium of 12 corporate partners and the German government that is working to demonstrate the suitability of hydrogen as a fuel for everyday use.

Progress and Performance

Vehicle + Fuel + Driver = GHG Emissions

The amount of carbon dioxide generated by the light-duty vehicle sector is dependent on three major factors:

1. The fuel economy of the vehicles, which in turn depends on many characteristics of the vehicles themselves (such as their weight, powertrain and aerodynamics);
2. The well-to-wheels greenhouse gas profile[1] of the fuels used in the vehicles; and
3. How the vehicles are used and maintained by their drivers.

Our shorthand for this, and the organizing framework for this discussion, is "Vehicle + Fuel + Driver = GHG emissions." More recently, we have added government to the equation, recognizing the indispensable role of governments in coordinating actions across sectors, providing leadership in areas like infrastructure development to meet transportation demand and creating a harmonized legal and political framework that leverages market forces to lead to the desired result.

1. In other words, emissions resulting from making, distributing and using the fuel.

Vehicle

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Vehicle + Fuel + Driver = GHG Emissions

During 2008 and early 2009, we introduced vehicles and technologies consistent with our blueprint for sustainability and CO_2 reduction goal.

The Ford Fusion Hybrid's SmartGauge™ with EcoGuide gives drivers information to help them maximize fuel efficiency.

- In the United States, we introduced two new hybrid vehicles: the Ford Fusion and Mercury Milan Hybrids. These vehicles have been rated by the U.S. Environmental Protection Agency (EPA) at 41 mpg in city driving and 36 mpg highway, making them the most fuel-efficient midsize sedans in America. We now offer four hybrid models and have sold more than 100,000 to date.
- We are offering EcoBoost™ technology on the 2010 Lincoln MKS, Lincoln MKT, Taurus SHO and Ford Flex in North America. EcoBoost uses a combination of turbocharging, direct injection and reduced displacement to deliver significant fuel-efficiency gains without sacrificing engine power or performance, improving vehicle fuel economy up to 20 percent and reducing CO_2 emissions up to 15 percent compared to larger displacement engines. EcoBoost, which will be offered globally, is also more affordable than many other fuel-efficiency technologies. By 2013, Ford will have EcoBoost V-6 and I-4 engines in approximately 1.3 million vehicles per year. In North America, 90 percent of Ford's nameplates will offer the technology.
- In 2008, we introduced the Ford Fiesta ECOnetic, which gets more than 62 mpg (approximately 78 mpg in Imperial gallons)[1] and emits just 98 g/km of CO_2, making it the most fuel-efficient five-seat family car in the UK. It joins the ECOnetic European Focus and Mondeo models, all of which use specially calibrated versions of already fuel-efficient diesel engines to achieve outstanding economy and emissions performance.
- We are using multiple fuel-saving technologies in all of our new vehicles. For example, through a combination of aerodynamics and other improvements, we improved the fuel economy of the entire 2009 F-150 lineup by an average of eight percent. We also introduced an F-150 Special Fuel Economy edition that delivers 21 mpg in highway driving, a 12 percent improvement in fuel economy over previous models and best-in-class fuel economy for full-size pickup trucks. In its most popular midsize engine, the 2009 F-150 gets unsurpassed fuel economy with 15 mpg city/20 mpg highway, which beats the Toyota Tundra's 14 city/17 highway with a comparable engine.[2]

More details about Ford's best-in-class vehicles are available in the Economy section of this report.

For the 2008 model year, the Corporate Average Fuel Economy (CAFE) of our cars and trucks increased by 2.9 percent relative to 2007. Preliminary data for the 2009 model year indicates that the CAFE of our cars and trucks will improve by another 4.0 percent compared to 2008.

As seen in the chart of Fuel Economy of U.S. Ford Vehicles by EPA Segment, our 2009 model U.S. vehicles are generally competitive with others in the industry in fuel economy, ranking better than average in three of nine categories, worse in two and the same in four.

RELATED LINKS
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Blueprint for Sustainability: An Overview
Vehicle Web Sites:
Ford Flex
2010 Lincoln MKS
2010 Lincoln MKT
Ford ECOnetic vehicles
Ford Fusion/Fusion Hybrid
Mercury Milan Hybrid

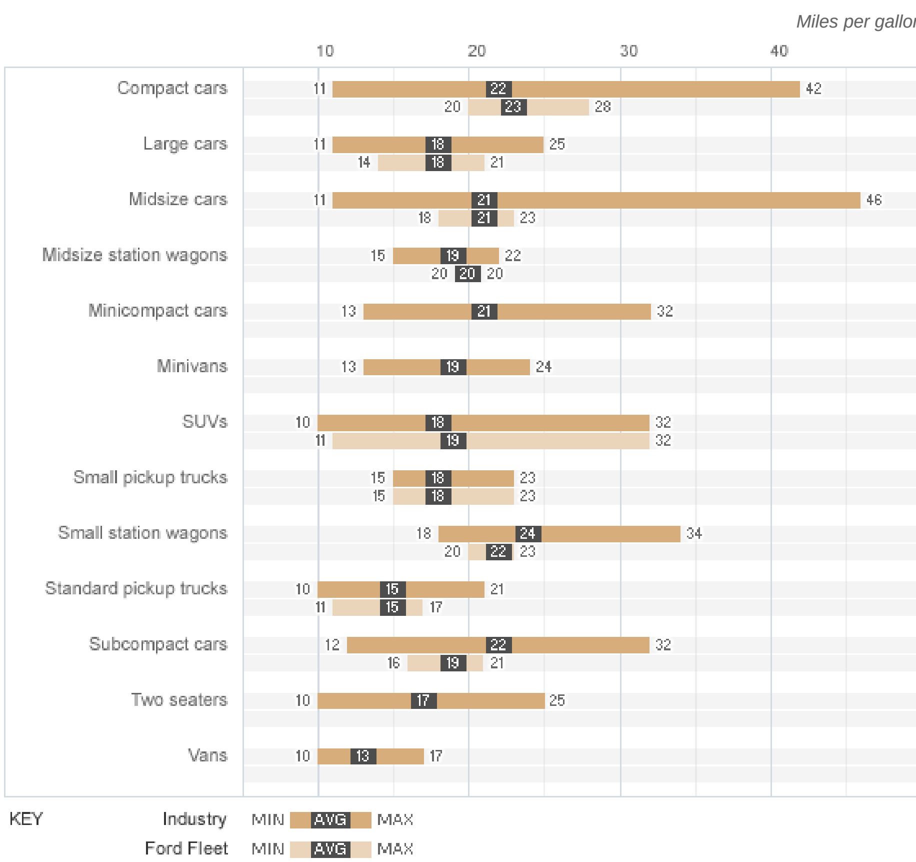
In Europe, we have reduced the average CO_2 emissions of the vehicles we sell by 18.9 to 22.9 percent depending on the brand, compared with a 1995 baseline. We have achieved these reductions by introducing a variety of innovations, including an advanced common-rail diesel engine, available on many of our vehicles, and lightweight materials. Ford is working on hybrid applications specifically designed to deliver benefits for the European market. Rather than full hybrids, in Europe we expect to see the widespread adoption of component parts of hybrid technologies. For example, "stop-start" systems and regenerative breaking will provide a cost-effective way to reduce CO_2 emissions. We are also developing a diesel micro-hybrid, which seems well-suited to the European driving environment and builds on the widespread acceptance of diesel technology, offering the best combination of performance, fuel economy and affordability for the region.

Improvements in the fuel economy of our vehicles will accelerate as we implement our Sustainable Technologies and Alternative Fuels Plan, which includes short-, medium- and long-term actions. The short-term actions have been incorporated into our cycle plan, which specifies the vehicles we will build in the next five years. We are actively researching and developing the technologies to be used in the mid to long term, including diesel hybrids and other clean diesel technologies; plug-in hybrids; biofueled vehicles; hydrogen internal-combustion engines; hydrogen fuel cell powertrains; and various combinations of these technologies, plus weight reductions.

The figures below show how we will leverage complementary technologies to cut CO_2 emissions significantly.

Fuel Economy of U.S. Ford Vehicles by EPA Segment

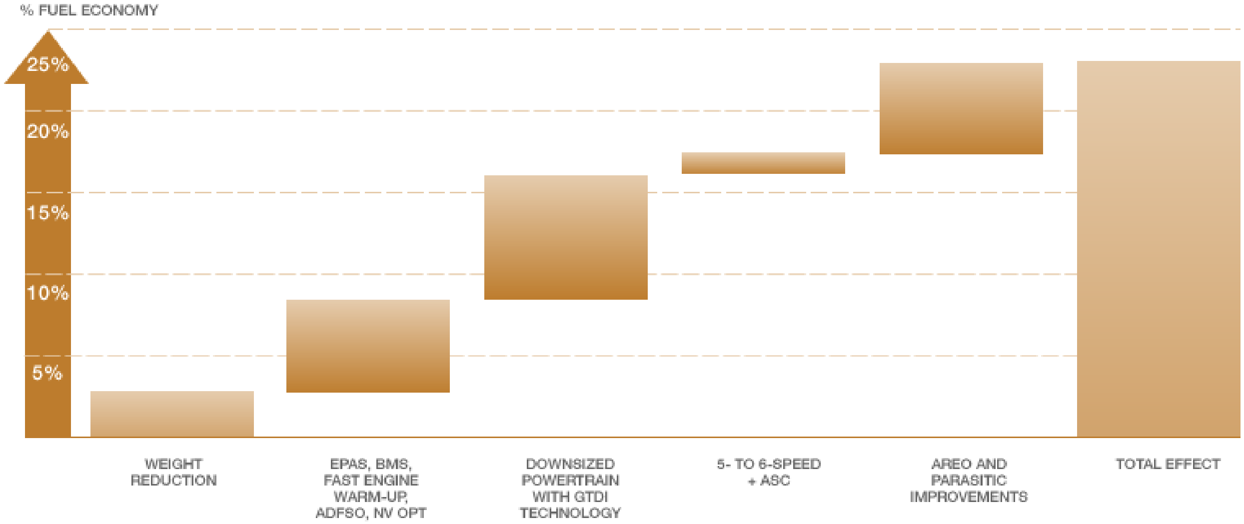
Chart | Table



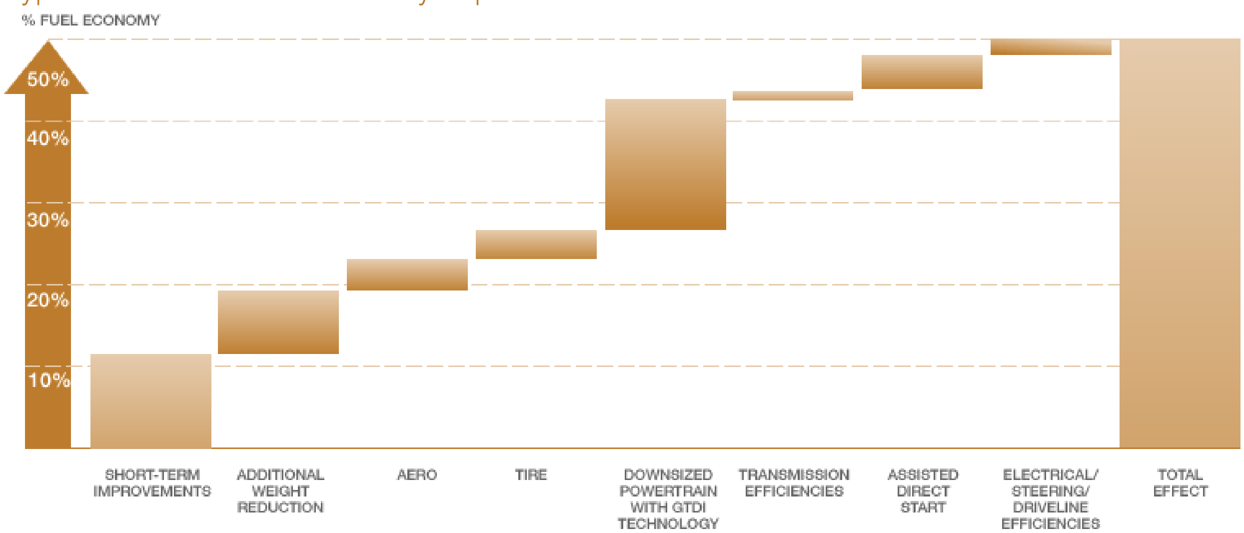
	Industry			Ford		
	Minimum	Average	Maximum	Minimum	Average	Maximum
Compact cars	11	22	42	20	23	28
Large cars	11	18	25	14	18	21
Midsize cars	11	21	46	18	21	23
Midsize station wagons	15	19	22	20	20	20
Minicompact cars	13	21	32	-	-	-
Minivans	13	19	24	-	-	-

SUVs	10	18	32	11	19	32
Small pickup trucks	15	18	23	15	18	23
Small station wagons	18	24	34	20	22	23
Standard pickup trucks	10	15	21	11	15	17
Subcompact cars	12	22	32	11	15	17
Two seaters	10	17	25	-	-	-
Vans	10	13	17	-	-	-
Total	10	19	46	11	19	32

Typical Near-Term Fuel Economy Improvements – Midsize Utility



Typical Mid-Term Fuel Economy Improvements – Small Car



For an explanation of the terms used in these figures, see the glossary.

Please note that improvements in fuel economy resulting from the use of the technologies identified in the above charts are often not additive or linear. The charts depict approximate percentage improvements estimated for particular technologies in a generic vehicle; actual improvements will vary depending on the characteristics of each specific vehicle.

1. ECOnetic vehicles are only available in Europe. The ECOnetic fuel economy calculations are based on European Fuel Economy Directive EU 93/116/EEC, which uses European drive cycles. They differ from fuel economy calculations developed in the U.S. and other regions of the world.
2. Class is full size non-hybrid pickups under 8,500 lbs. GVWR

Fuel

Vehicle + Fuel + Driver = GHG Emissions

To reduce vehicle GHG emissions, the development of fuels with lower fossil carbon content[1] is a vital complement to improvements in the fuel economy of our vehicles.

Electrification

Running vehicles partly or wholly on electricity can reduce or eliminate CO_2 emissions from the vehicle itself, but the overall emission benefits depend on the fuel or mix of fuels used to make the electricity. Because electricity can be made from a wide variety of fuels, including domestic sources and renewable fuels, electrification addresses both energy security and climate change concerns. It also offers flexibility in tailoring lower-carbon solutions based on locally available fuels and technology options like carbon capture and storage. We have accelerated the electrification part of our vehicle and fuel technology plan, as follows:

- In 2010, we will introduce the Transit Connect battery electric vehicle, a compact van, for low-volume sales to fleets.
- By 2011, we will bring a battery electric Focus to North America.
- In 2012, we will introduce our next-generation hybrid technology and plug-in hybrid vehicles.

Expanding electrification holds tremendous promise, but a range of implementation challenges must be considered. These challenges relate to cost, battery technology, the development of charging infrastructure, the interface with utilities and how to ensure that potential emissions-reduction benefits are realized. We have partnered with the Electric Power Research Institute and Southern California Edison to explore these and other issues involved in expanding the use of plug-in hybrid electric vehicles. This partnership was expanded in early 2009, and through it Ford will now supply plug-in vehicles to eight additional partners for real-world testing:

- New York Power Authority
- Consolidated Edison of New York
- American Electric Power of Columbus, Ohio
- Alabama Power of Birmingham, Alabama, and its parent, Atlanta-based Southern Company
- Progress Energy of Raleigh, North Carolina
- DTE Energy of Detroit, Michigan
- National Grid of Waltham, Massachusetts
- New York State Energy and Research Development Authority

Electrification issues and our partnerships are discussed in more detail in the electrification case study.

Biofuels

Biofuel use is expanding globally, with bio-ethanol made from corn, beets or sugar cane substituting for gasoline and biodiesel derived from plant oils substituting for diesel fuel. In the United States, 2007 legislation expanded the Renewable Fuel Standard (RFS), mandating a significant increase in the use of biofuels by 2022.

While current corn-based bio-ethanol production in the United States is estimated to provide a modest reduction in vehicle GHG emissions on a well-to-wheels basis, next-generation biofuels such as ligno-cellulosic bio-ethanol could offer up to a 90 percent GHG reduction benefit.[2] Building a substantial fleet of flexible fuel vehicles (FFVs) provides a bridge to the widespread use of lower-carbon biofuels in the future.

Ford has a long history of developing vehicles that run on renewable biofuels. We produced the first flexible fuel vehicle approximately 100 years ago: a Model T capable of running on gasoline or ethanol.

RELATED LINKS
In This Report:
Renewable/Biofueled Vehicles
External Web Sites:
• Electric Power Research Institute

Globally, Ford offers 19 models in the United States, Europe, Asia and South America that can run on E85, a blend of up to 85 percent bio-ethanol mixed with gasoline. Ford has manufactured more than four million FFVs, including 2.5 million in the United States and 1.8 million in Brazil.

In Europe, Ford is a market leader and pioneer in bio-ethanol-powered FFVs, with nearly 65,000 vehicles delivered to customers since 2001. Ford FFV models are now available in 17 European markets, with Sweden, Germany, the Netherlands, Spain and France showing the strongest demand.

In the United States, we have committed to doubling the number of FFVs in our lineup by 2010. Assuming continuing incentives that encourage the manufacture, distribution and availability of renewable fuels and the production of FFVs, we stand ready to expand FFV output to 50 percent of total vehicle production by 2012.

Alternative fuels pose a classic chicken-and-egg problem, however: automakers can produce a range of products capable of running on fuels with varying carbon content, but the benefits are only realized if energy providers bring the fuels to market and consumers demand both the vehicle and the fuel.

Ford is part of Bio-Ethanol for Sustainable Transport, or BEST, which has pilot projects planned or under way in the UK, Spain, Italy and the Netherlands. We are also supporting the PROCURA project, which is establishing test programs for ethanol, biodiesel and natural gas in Italy, Portugal, Poland, Spain and the Netherlands.

The markets for ethanol alternatives to gasoline were affected by the plunge in oil prices in the latter half of 2008. In the long term, we believe that next-generation biofuels made from a variety of feedstocks, including agricultural wastes (particularly ligno-cellulosic material) will be an important part of the GHG emission-reduction equation and will help address concerns about current-generation biofuels, including the potential competition between food and fuel crops and conversion of natural lands to fuel production. These issues are explored in more detail in the Sustainable Technologies and Alternative Fuels Plan.

1. Of course, there is not only a need to reduce the fossil carbon content of the fuel itself, but to reduce any fossil-based CO_2 emitted during feed-stock excavation, fuel production and distribution.
2. *Ethanol: The Complete Lifecycle Picture*, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy, March 2007.

Driver

Vehicle + Fuel + Driver = GHG Emissions

Paradoxically, the "driver" portion of the GHG emissions equation holds the potential for substantial emission reductions at minimal cost, but it is often overlooked. Ultimately, drivers decide which vehicles and fuels they will purchase and how those vehicles will be driven. While our major focus is on the vehicles we make, we have also reached out to drivers around the world to promote the practice of "eco-driving."

Ford has demonstrated that drivers who practice "eco-driving" can improve their fuel economy by an average of 24 percent. Eco-driving tips are available to the public on Ford's Web site and online training is available through the Driving Skills for Life (DSFL) program. In addition, a Web-based eco-driving program has been available to all U.S. salaried Ford employees since 2006.

Ford began work on the eco-driving concept in 2000, when we first offered an eco-driving program through our German dealerships, in partnership with the German Federation of Driving Instructor Associations and the German Road Safety Council. The program trains drivers in conservation-minded driving and vehicle maintenance habits. The program uses specially trained and certified instructors to run programs for several target groups, including fleet drivers and customers. During 2008, approximately 1,000 drivers participated in the program.

During 2008, we expanded our eco-driving training efforts globally. In the U.S., Ford partnered with Phoenix-based Pro Formance Group to pilot a hands-on U.S. training program. As a first step, top instructors from the German program trained U.S. trainers in coaching techniques. These trainers, in turn, trained drivers to test a pilot approach that would certify eco-driving instructors to train Ford's fleet customers.

Over a four-day period, Ford and the Pro Formance drivers conducted validation tests using volunteers from Phoenix who were given individual coaching on specific driving behaviors. The Sports Car Club of America verified the results, which showed an average 24 percent improvement in fuel economy as a result of the hands-on eco-driving training. The 48 drivers who took part saw results ranging from six percent fuel economy improvement to more than 50 percent, depending on their driving style and ability to master eco-driving behaviors. Eco-driving instructors coached drivers to employ smoother breaking and accelerating, monitor their RPMs and drive at a moderate speed.

In Asia, Ford launched the DSFL driver training program in 2008 with a "train-the-trainers" workshop in Bangkok, Thailand, in March. At the workshop, Ford professionals from Germany trained two to three representatives from the Philippines, Vietnam, Thailand and Indonesia. The DSFL program was customized to address the higher average age of beginner drivers in the region, as well as the unique driving environments within each market. It places equal emphasis on safe driving and eco-driving, as customers in the region are interested in both.

A press conference and drive training for media were held in each country, followed by classroom instruction and drive training sessions for selected groups and members of the general public. By early 2009, more than 5,000 people had participated in the training, including nearly 700 in Vietnam, over 1,000 in Thailand and more than 500 in Indonesia. The Philippines accounts for the remainder. In 2009, the program will be expanded to Taiwan, China and India. The DFSL launch is discussed in more detail in the case study "Driving Skills for Life: Asia Pacific Expansion."

We are also reaching out to our dealer body to create eco-driving awareness with car buyers and engaging policy makers about the possibility of integrating eco-driving techniques into driver education.

RELATED LINKS

On Ford.com:

Eco-Driving: Ten Easy Tips for Saving Fuel

External Web Sites:

Driving Skills for Life: Eco-Driving

Climate Change Policy and Partnerships

Over the past year, evidence of climate change has continued to mount, increasing the urgency of a coordinated, effective policy response. At the same time, the policy landscape has shifted considerably. The European Parliament passed legislation that sets new restrictions on vehicle emissions. In the United States, the new Obama Administration has stated that the passage of comprehensive federal climate change legislation is a top priority. States and federal agencies are also acting in various ways on regulatory approaches to vehicle greenhouse gas (GHG) emissions.

At Ford, we accept that simply "not getting worse" is not good enough. The auto industry must work together with suppliers, government, the fuel industry and consumers to reduce carbon dioxide (CO_2) levels from transportation so we can help stabilize atmospheric CO_2 concentrations. Accomplishing this goal will require that all sectors of the economy, including the transportation sector, do their share. To achieve real and lasting results, all global stakeholders must make long-term commitments for a sustainable future.

In the United States and elsewhere, we are actively advocating for comprehensive policy approaches that will provide a coherent framework for GHG emission reductions, so that companies can move forward in transforming their businesses with a clear understanding of their obligations. This section discusses climate policy developments in the United States and Europe; Ford's partnerships and engagements around climate change; and our involvement in emissions trading.

To achieve real and lasting results, all global stakeholders must make long-term commitments for a sustainable future.

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U.S. Climate Change Legislation

In the United States, the linked issues of climate change and energy security create an urgent need to transform the country's economy into one with lower greenhouse gas emissions, higher energy efficiency and less dependence on fossil fuels and foreign oil. This transformation will require changes in all sectors of the economy and society. A comprehensive legislative framework is needed to spur these changes.

Since 2007, Ford has been a member of the U.S. Climate Action Partnership (USCAP), a group of businesses and leading environmental organizations that have come together to call on the federal government to quickly enact strong national legislation to require significant reductions of GHG emissions. With a new administration in Washington that is committed to enacting climate legislation, the prospects for a new U.S. policy framework are stronger than ever.

In January 2009, USCAP released ***A Blueprint for Legislative Action***, a report that details comprehensive, integrated policy recommendations for developing legislation that would create an environmentally effective and economically sustainable national climate protection program. The ***Blueprint*** is a consensus product of a diverse group of companies and environmental organizations; it attempts to provide a balanced approach to key linked issues that must be addressed in any national climate legislation. The ***Blueprint*** recommends a cap-and-trade program and complementary standards as a framework for legislation that can slow, stop and reverse the growth of greenhouse gas emissions. Specific USCAP recommendations include:

- A broad scope of coverage to encompass GHG emissions from large stationary sources as well as the carbon content of fossil fuels used by other sources;
- Cost-containment measures to both encourage investment in emissions-reducing technology and reduce potential volatility in the cost of emissions allowances;
- Principles to guide the fair and equitable allocation of allowance value, to mitigate costs to consumers and affected sectors of the economy; and
- Credit for early action. (In other words, companies like Ford that have already made substantial emissions reductions would not be penalized for those actions.)

USCAP also recommends "complementary measures" beyond a cap-and-trade system to address certain types of emissions, including those from the transportation sector. For example, USCAP recommends implementing a GHG performance standard for transportation fuels, following the development of a methodology to determine the life-cycle carbon intensity of these fuels. They also support a national low-carbon fuel performance standard, which is an important complement to vehicle technology actions. Other USCAP recommendations address the efficiency of commercial vehicles and transportation systems.

USCAP members prefer a cap-and-trade program with complementary policies over a carbon tax, for several reasons. Both approaches would set a price for carbon that would influence economic activity, and either approach could be complex to implement. However, a cap-and-trade approach enables policy makers to set specific targets for GHG emissions reductions, while a carbon tax does not. A cap-and-trade system would also facilitate long-range planning and could be linked to global carbon markets. As a market-based approach, cap-and-trade adjusts to economic conditions and prices carbon efficiently. In preparing its proposals, USCAP analyzed potential implementation issues and has recommended steps to address them.

USCAP is currently reaching out to the government and other stakeholders to build support for its recommendations and participate in the process of developing national legislation.

RELATED LINKS
External Web Sites:
U.S. Climate Action Partnership

U.S. Greenhouse Gas and Fuel Economy Regulation

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Over the last year or so, a number of significant developments have taken place in the United States with respect to regulatory programs that would set greenhouse gas emissions or fuel economy standards for motor vehicles.

- In July 2008, the U.S. Environmental Protection Agency (EPA) issued an Advance Notice of Proposed Rulemaking requesting comment on the potential regulation of GHGs from both mobile and stationary sources under the federal Clean Air Act (CAA). In April 2009, the EPA published a proposed "endangerment" finding for GHGs; if the EPA finalizes this finding, it would trigger a number of regulatory provisions under the CAA. The EPA has also issued a proposed set of regulations on the reporting of GHG emissions from mobile and stationary sources.
- In March 2009, the National Highway Traffic Safety Administration (NHTSA) promulgated final Corporate Average Fuel Economy (CAFE) standards for the 2011 model year. By April 2010, NHTSA is expected to issue standards for the 2012 through 2016 model years.
- In January 2009, President Obama requested the EPA to reconsider its earlier denial of a waiver for California's AB 1493 regulations, which would impose GHG standards on motor vehicles at the state level. Congress has directed EPA to complete its review by June 30, 2009.
- On May 19, President Obama announced a framework agreement among the federal government, the State of California and automobile manufacturers to develop a national standard for fuel economy/greenhouse gas emissions for model years 2012–2016.

With the announcement of a National Standard for fuel economy and greenhouse gas emissions, the EPA and NHTSA have agreed to work to produce harmonized standards, which are intended to allow manufacturers to build a single light-duty national fleet that would satisfy all requirements under both programs. This would avoid a situation in which three separate regulatory programs are established – two at the federal level and one at the state level – all regulating the same conduct. As we have discussed in previous reports, the vast majority of GHGs emitted by motor vehicles are in the form of CO_2. Standards regulating tailpipe CO_2 emissions are thus essentially fuel economy standards by another name, since the amount of tailpipe CO_2 emitted is directly proportional to the amount of fuel consumed. This has been acknowledged by NHTSA.[1]

From an environmental standpoint, there is no need for three overlapping and competing programs to address motor vehicle GHGs. Multiple programs would create huge logistical problems and economic inefficiencies in exchange for little or no environmental benefit. As discussed in the European Policy section, the nations of Europe have recognized the need for one continent-wide regulatory program covering the European vehicle market, rather than a patchwork of programs administered by each individual nation.

The new, harmonized standards announced by the Obama Administration will employ an "attribute-based" structure in which a manufacturer's fuel economy standard is based on the fleet of vehicles it sells. The attribute-based approach was developed by NHTSA to mitigate competitive disparities caused by the old approach to fuel economy regulation, which imposed a one-size-fits-all standard on all manufacturers. The attribute-based approach is more effective in driving fleet-wide fuel economy improvements.

The harmonized federal program also allows for fleet averaging on a nationwide basis, which is critical to vehicle manufacturers. Since a manufacturer's fleet mix at the state level can vary considerably from its overall national fleet mix, state-specific standards would likely lead to product restrictions and reduced consumer choice in some states. Nationwide fleet averaging avoids this problem with no loss of environmental benefits.

We appreciate the efforts of the Obama Administration to develop a harmonized national program. We are committed to working with the EPA and NHTSA toward a challenging but feasible set of GHG and fuel economy standards that take into account the state of vehicle technology, and the practical ability of manufacturers to integrate such technology into their vehicle fleets, in light of economic realities and engineering lead-time requirements. Such a national program will enable the United States to move forward toward its environmental objectives in an efficient and effective manner. It will also be a useful complement to comprehensive, economy-wide cap-and-trade climate legislation.

RELATED LINKS
External Web Sites:
National Highway Traffic Safety Administration
California Air Resources Board

1. See 71 FR 17566, 17659 (April 6, 2006).

Incentives for Fleet Renewal

As Ford brings hybrids, EcoBoost™ engines and electric vehicles to market, one challenge will be how to encourage consumers to replace their older, less-efficient vehicles with those offering new technologies. This is a particular problem in the current economic environment, in which vehicle sales have dropped dramatically. Some European countries have provided incentives to consumers to buy vehicles that are more fuel-efficient. This also helps cut pollution from tailpipe emissions, as newer vehicles generally have cleaner exhaust.

In Germany, for example, a government program provides discounts for new-car buyers of €2,500 (about $3,400 at current exchange rates), with the trade-in of a car at least nine years old that will be scrapped. The program helped boost car sales in March 2009 to a rate 40 percent higher than the previous year.[1]

Ford would like to see a similar approach enacted in the United States to spur sales, boost tax revenue and reduce CO_2 and smog-forming emissions from vehicles.

New car buyer incentives can help spur vehicle sales, boost tax revenue and reduce CO_2 and smog-forming emissions from vehicles.

1. Source: Federal Office of Motor Transport Germany (Kraftfahrtbundesamt Deutschland).

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European Policy

In December 2008, new legislation aimed at reducing carbon dioxide emissions passed the European Parliament. As the Council of the European Union (the other EU legislative body) is expected to follow this decision, the EU is set to adopt an extremely tough piece of legislation, part of an ambitious European energy and climate change package to which the industry will continue to contribute. The European auto industry is ready to meet the new law's standards for passenger cars, despite the sudden dramatic economic downturn that severely limits the resources available to respond.

Under the legislation, manufacturers will be required to ensure that their average fleet CO_2 emissions – for all the vehicles they make that are registered in the EU – are below 130 g/km. In 2012, 65 percent of the manufacturer's fleet must comply with this target. The percentage increases to 75 percent in 2013, 80 percent in 2014 and 100 percent in 2015. The long-term target for CO_2 emissions is set to 95 g/km; it will be reviewed again in 2013.

This legislation gives the auto industry some essential flexibility to adjust its development and production cycles to the legal requirements and to limit the financial risks caused by largely unpredictable factors, including consumer preferences, market trends, economic developments and legal requirements in different fields.

The industry will continue to invest heavily in research and development and new product programs in order to reach the short-term targets. The long-term target will require technological breakthroughs, new refueling infrastructure and a swift renewal of the car fleet on Europe's roads.

Partnerships and Collaboration

Addressing the linked issues of climate change and energy security requires an integrated approach – a partnership of all stakeholders, including the automotive industry, the fuel industry, other industries and enterprises, government and consumers. It will also require the best thinking from all of these sectors.

Ford is involved in numerous partnerships and alliances with universities, coalitions, nongovernmental organizations and other companies to improve our understanding of climate change. For example, Ford is:

- A member of the United States Climate Action Partnership (USCAP), an alliance of major businesses and leading climate and environmental groups that have come together to develop an economy-wide, market-driven approach to reduce greenhouse gas emissions, as discussed in the U.S. Climate Change Legislation section
- Working closely with BP to explore vehicle technologies and low-carbon fuel technologies
- A founding member of the Carbon Mitigation Initiative at Princeton University to study the fundamental scientific, environmental and technical issues related to carbon management
- A charter member of the Sustainable Transportation Energy Pathways Program at the University of California-Davis Institute of Transportation Studies, which aims to compare the societal and technical benefits of alternative sustainable fuel pathways
- A member of the Massachusetts Institute of Technology's Joint Program on the Science and Policy of Global Climate Change

Our participation in these and other partnerships helps us to formulate improved strategies for products and policies that will in turn help to address climate change and energy security. The following are links to the above organizations and others with which we cooperate on climate change issues:

- 25 x '25 (Energy Futures Coalition)
- BP
- Center for Clean Air Policy (CCAP) Climate Policy Initiative
- Diesel Technology Forum (DTF)
- Governors' Ethanol Coalition (GEC)
- Harvard University, Belfer Center for Science and International Affairs
- MIT Joint Program on the Science and Policy of Global Change
- National Ethanol Vehicle Coalition (NEVC)
- Princeton Carbon Mitigation Initiative (CMI)
- Resources For the Future (RFF) U.S. Climate Policy Forum
- United States Climate Action Partnership (USCAP)
- University of California-Davis Institute of Transportation Studies Sustainable Transportation Energy Pathways Program
- Worldwide Business Council for Sustainable Development (WBCSD)
- World Resources Institute (WRI)

Emissions Trading

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Emissions trading is a key tool in both voluntary and mandatory greenhouse gas emissions-reduction programs. Ford was an early participant in carbon markets, with a goal of gaining experience that will be valuable in an increasingly carbon-constrained world.

For example, Ford, along with 11 other companies and the City of Chicago, founded the Chicago Climate Exchange (CCX). The CCX is a GHG emissions-reduction and trading program for emission sources and projects in North America. It is a self-regulated, rules-based exchange designed and governed by CCX members. Ford is the first and only auto manufacturing participant in the Exchange.

Through the CCX, we have committed to reducing our North American facility emissions by six percent between 2000 and 2010. The Exchange marks the first time in the United States that major companies in multiple industries have made a voluntary binding commitment to use emissions trading to reduce their North American GHG emissions. The Exchange enables participants to receive credit for their reductions and to buy and sell credits to find the most cost-effective way of achieving reductions.

Ford was also one of the original companies to join the UK Emissions Trading Scheme, the first government-sponsored, economy-wide, cross-industry GHG trading program. Ford Motor Company Limited (UK) entered the program in March 2002, committing to and achieving a five percent CO_2 reduction for eligible plants and facilities over five years.

Ford now participates in the EU Emission Trading Scheme, which commenced in January 2005 and is one of the policies being introduced across Europe to reduce emissions of carbon dioxide and other greenhouse gases. The second phase of this program runs from 2008 to 2012 and coincides with the first Kyoto Commitment Period. Additional five-year phases are expected to follow.

Despite Ford facilities' low-to-moderate CO_2 emissions (compared to other industry sectors), the EU Emission Trading Scheme regulations apply to eight Ford and Volvo facilities in the UK, Belgium, Sweden and Spain. The trading scheme requires us to apply for emissions permits, meet rigid emissions monitoring and reporting plans, arrange for third-party verification audits and manage tax and accounting issues related to emissions transactions.

Ford is actively involved in ongoing evaluation of the EU Emissions Trading Scheme at both EU and member state levels. We have used the experience gained from participation in the market-based mechanisms described above to ensure that we operate in compliance with the EU Trading Scheme's regulatory framework. Ford anticipated the start of the EU Emission Trading Scheme and established internal business plans and objectives to maintain compliance with the new regulatory requirements.

Comprehensive reporting forms the foundation for all emissions trading. We voluntarily report GHG emissions in Australia, Canada, China, Mexico and the Philippines. This reporting, which has won several awards, is discussed in the Environment section.

RELATED LINKS

External Web Sites:

Chicago Climate Exchange

UK Emissions Trading Scheme

EU Emissions Trading Scheme

Case Studies

A Look Inside the "Black Box"

When Ford's Climate Change Task Force members decided to base product planning on the goal of climate stabilization, they asked Ford's in-house scientists to devise a way to test scenarios for meeting that goal. The result was a sophisticated CO_2 model that looks at how vehicle technologies and alternative fuels can contribute to reducing emissions significantly.

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Electrification: A Closer Look

The first vehicles to run on electricity were manufactured more than 100 years ago. But a set of factors is converging to raise interest in vehicle electrification to the highest level since then. The electrification of vehicles has potential sustainability and cost advantages, but a range of issues must be addressed to realize this potential.

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A Look Inside the "Black Box"

In 2004, Ford's internal Climate Change Task Force faced a dilemma. After an extensive study, it was clear to the cross-functional group of senior executives that several forces were converging to fundamentally change vehicle markets, especially in North America and Europe. Current and anticipated climate change and fuel economy regulation, rising fuel prices and growing consumer awareness of the climate change issue all pointed to a shift in sales toward cars rather than trucks and toward smaller and more fuel-efficient vehicles. We needed to rapidly reorient our product offerings.

But what should drive new product goals? As a practical matter, the Company needed to be able to meet new regulatory mandates. Beyond that imperative, we had taken to heart our responsibility to contribute to meeting the challenge of climate change. So, Task Force members decided to base product planning on the goal of climate stabilization, and they asked Ford's in-house scientists to devise a way to test scenarios for meeting that goal.

In 2005, Ford's scientists began development of a CO_2 model. To create it, they modified the Sustainable Mobility Project model (developed by the International Energy Agency) and combined it with global carbon-dioxide (CO_2) emission-reduction pathways for varying levels of atmospheric CO_2 stabilization (as described by the Model for the Assessment of Greenhouse-gas Induced Climate Change, developed by the National Center for Atmospheric Research). The scientists then calculated the CO_2 emission reductions required of new light-duty vehicles up to the year 2050 for a range of CO_2-stabilization levels and different regions of the world, using a simplifying assumption that the rates of CO_2 emission reduction should be the same across all sectors.

At the lower CO_2-stabilization levels, the required emission reductions are extremely challenging and cannot be accomplished using vehicle technology alone. Joint investigations with BP provided insight into how the best new vehicle technologies and low-carbon alternative fuels can jointly and realistically fulfill the low CO_2-emission requirements. Ford's CO_2 model and other modeling tools were combined to explore assumption sensitivities around vehicle technologies, baseline fuels, biofuels, costs and consumer response. The CO_2 model is not intended to provide "the answer," but rather a range of possible vehicle and fuel solutions that contribute to a pathway to CO_2 reductions, and eventually, climate stabilization. Our blueprint for sustainability – and the product actions it spells out – are based on options developed through this modeling exercise.

The model and its results have been a centerpiece of discussions with a variety of stakeholders. Below are some of the questions that have been raised through these discussions, and answers to them.

How does the model account for emissions growth or reduction in developing countries?

We recognize that developing countries generally have relatively low per capita energy use but high rates of emissions growth, reflecting growing economies. The CO_2 model uses a science-based approach that allows for equitable growth in developing countries, to derive CO_2 reduction targets for light-duty vehicles consistent with 450 parts per million (ppm) to 550 ppm CO_2 stabilization pathways.

Since fuel use is the dominant cause of CO_2 emissions, how does the model account for projected changes in the carbon footprint of automotive fuels?

Ford has studied multiple scenarios in which the auto industry and the energy industry work together to reduce overall well-to-wheels CO_2 emissions from the light-duty transportation sector. These joint-strategy scenarios (see figure below) allow us to develop a least-cost vehicle technology roadmap. For the carbon footprint of fuels, we rely on the well-to-tank CO_2 emissions for different alternative fuels estimated by different region-based models, including the Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model for North America, and the EUCAR/JRC/CONCAWE analysis for Europe.

Are you continuing to test alternative scenarios?

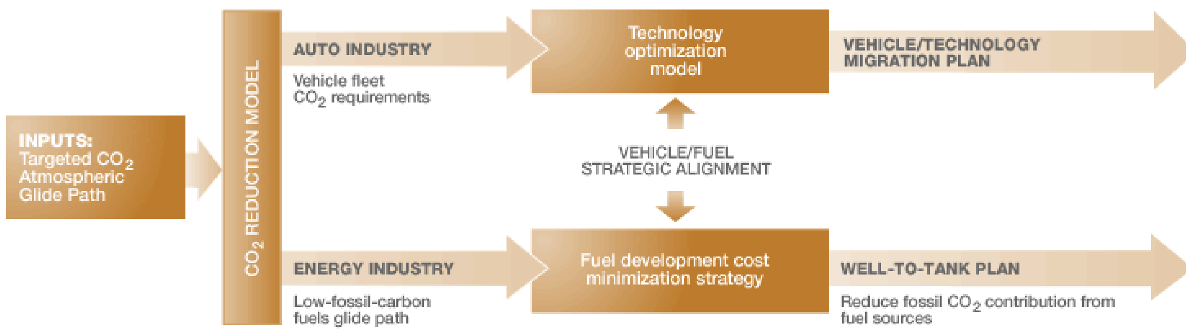
In the long run, the roles of consumers, governments and fuel availability will be pivotal in dictating actual CO_2 emission reductions, and Ford continues to take them into consideration in fine-tuning a truly viable and sustainable CO_2 stabilization pathway.

How does the model consider the cost of technologies and alternative fuels?

The costs of technologies and alternative fuels that are not yet in the market are separately estimated. These estimates obviously have large uncertainties, but are useful for planning purposes. Ford has other models that look into potential market response to fuel/vehicle cost variations.

In a separate study, Ford has developed a model that looks into minimal-cost scenarios across different sectors and explores assumption sensitivities around vehicle technologies, fuel technologies, connections between the different energy sectors, and biofuels. The model provides information on the combinations of options that will yield the required emissions reductions at an affordable cost. We have used this model to develop scenarios to assess the global lowest-cost vehicle and fuel technology solutions consistent with CO_2 stabilization.

Ford's Sustainability Framework for CO_2 and Technology Migration Development



Electrification: A Closer Look

Print report
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RELATED LINKS
External Web Sites:
U.S. Climate Action Partnership

Ford Battery Electric Vehicle: Ford and strategic alliance partner Magna International will produce new battery electric vehicles (BEVs) that don't use a drop of fuel.

During the 1930s, "electrification" meant extending electrical service to remote areas of the United States to replace traditional fuels like kerosene. Today, "electrification" refers to developing the technology and infrastructure necessary to replace traditional oil-based vehicle fuels with electricity.

This concept is not new: The first vehicles to run on electricity were manufactured more than 100 years ago. But a set of factors (described below) is converging to raise interest in vehicle electrification to the highest level since then.

- **The volatile cost of oil.** The cost of gasoline and diesel fuel has been on a roller coaster the past several years. The price of U.S. light sweet crude oil rose rapidly from about $85 per barrel at the end of 2007 to more than $147 per barrel in July 2008. It then fell even more rapidly, ending the year at about $32 per barrel. Motor fuel prices followed a similar pattern, providing a vivid reminder of consumers' and businesses' vulnerability to events in global oil markets and renewing interest in the search for alternatives.
- **Improvements in battery technology.** Batteries have historically limited the widespread use of electrified vehicles (EVs), because of issues with battery size, capacity and cost. While all of these factors continue to present challenges, the technology has improved, and newer batteries – especially the lithium-ion type used in cell phones and laptops – offer advantages for use in EVs.
- **The need to reduce greenhouse gas emissions.** Improving the fuel economy of gasoline- and diesel-fueled vehicles can reduce greenhouse gas emissions, but only so far, since gas and diesel are fossil fuels. To achieve the level of reductions called for by the U.S. Climate Action Partnership and others, alternative sources of energy, such as renewable fuels and electricity, are needed (see WTW Fossil CO_2 Emissions for 2010 Compact-Size Vehicle).
- **Concerns about energy independence.** Electricity can be generated from a number of energy sources, so electrification can help oil-importing countries reduce their oil use.

Electrification: A Closer Look

Electrification: A Spectrum of Technologies

Electricity plays a role in all current vehicle technologies. For example, conventional gas and diesel vehicles typically rely on a lead-acid battery to provide power to start the vehicle. Recently, in the quest for better fuel economy and lower greenhouse gas emissions, automakers have begun to design a range of vehicles that use electric power for more functions, including providing some or all of the power to move the vehicle.

A range of vehicle types, from conventional gas to pure electric, is shown in the table below. In the near term, the largest volume of electrified vehicles will likely be hybrid electric vehicles (HEVs), which use both a gas engine and a battery electric motor but do not plug into the electric grid. In the longer term, however, electrified vehicles that get some or all of their energy directly from the electric grid, including plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs), are likely to play an increasingly significant role. The table below provides a generalized overview of the relative benefits and impacts of these different electrified vehicle technologies, based on an average compact or "C-sized" sedan like the Ford Focus. The data is based on Ford's testing and modeling research. However, it is not precisely representative of any specific products Ford currently makes or may make in the future.

	Internal Combustion Engine	Micro-Hybrid	HEV	PHEV	BEV
Technology overview	Traditional gas or diesel engine	Uses only traditional gas or diesel engine and powertrain, but adds stop/start capability, which shuts down the engine when the vehicle is stopped and automatically restarts it before the accelerator pedal is pressed to resume driving. Also has regenerative brake recharging to improve fuel economy.	Uses both a gas or diesel engine and an electric motor. Can run exclusively on battery power, exclusively on gas power or on a combination of both. Also has stop/start capability and regenerative braking.	Similar to an HEV but uses a high-capacity battery that can be charged from an ordinary household outlet. When the battery is depleted, the PHEV runs in normal hybrid mode (like a regular HEV). Another type of PHEV, often called a Range Extender Electric Vehicle, runs entirely on battery power until the battery is depleted and then switches to 100 percent gas engine power until the battery is recharged.	Uses only a battery electric motor, no gas or diesel engine. Runs entirely on electricity from batteries, which can be charged from household outlets or specialized charging stations.
Ideal driving conditions	Flexible for a wide range of uses.	Flexible for a wide range of uses, with improved fuel economy in urban driving.	Flexible for a wide range of uses, with excellent urban fuel economy and improved highway fuel economy.	Flexible for a wide range of uses, with dramatically improved fuel economy in city driving. Ideal for longer commute distances than a BEV allows.	Ideal for customers with shorter, predictable daily trips of less than 100 miles total.
Technology Benefits/Costs based on Compact or "C-sized" Sedan [1]					
Fuel Economy [2]	~30 mpg	~31–32 mpg	~45 mpg [3]	Up to 170 mpg [4]	Up to 140 mpg

(Roughly real-world fuel economy for a compact sedan)					equivalent [5]
Range on tank/charge [6]	˜405 miles/tank	˜425 miles/tank	˜610 miles/tank	An all-electric operating range of 30–50 miles, depending on battery size. A minimum 800-mile range when combining electric and gas.	Up to 100 miles on a charge.
Fueling/Charging time	Minutes	Minutes	Minutes	5–8 hours with a 110-volt outlet.	6 hours with a 220-volt outlet and 12 hours with a 110-volt outlet.
CO_2 emissions	[8]	[9]	[10]	[11], [13], [14]	[12], [13], [14]
Well to Tank	˜35 g/km		˜23 g/km	Current Grid: ˜91 g/km Future Grid: 60 g/km	Current Grid: ˜115 g/km Future Grid: ˜71 g/km
Tank to Wheels	˜150 g/km		˜100 g/km	Current Grid: ˜26 g/km Future Grid: 25 g/km	Current Grid: 0 g/km Future Grid: 0 g/km
Well to Wheels [7]	˜185 g/km		˜123 g/km	Current Grid: ˜117 g/km Future Grid: 85 g/km	Current Grid: ˜115 g/km Future Grid: ˜71 g/km
Purchase price premium	$0	$300 to $500	$3,500 to $5,000	$15,000 to $20,000	$25,000 to $30,000
Annual fuel cost	˜$1,200 annual fuel costs [15]	˜$1,125 annual fuel costs [16]	˜$800 annual fuel costs [17]	˜$430 annual fuel costs [18]	˜$330 annual fuel costs [19]
Payback period [20]	NA	˜4 to 7 years	˜9 to 12 years	˜19 to 26 years	˜28 to 34 years

1. These numbers are for comparison purposes only. They are based on modeling and testing calculations and do not necessarily represent the numbers that would be achieved in real-world driving conditions, nor do they represent actual products that Ford currently makes or may produce.
2. The internal-combustion engine fuel-economy estimate is based on the calculation used by the U.S. Environmental Protection Agency to develop fuel economy values on new vehicle "window stickers", which are intended to represent the fuel economy consumers can expect under real-world driving conditions. Estimates for the other technologies are based on the metro-highway drive cycle used for the U.S. fuel-economy regulations. The fuel-economy values on vehicle "window stickers" are usually 15 to 20 percent lower than metro-highway fuel economy values for the same vehicle. Fuel economy calculations for all of the technologies are based in U.S. gallons and on U.S. drive cycles.
3. In general, HEVs deliver approximately 40–50 percent better fuel economy than comparably sized non-hybrids.
4. Fuel economy for PHEVs depends on the fraction of travel in electric mode; the 170 mpg estimate assumes 100 percent of travel in the electric mode. This estimate is calculated based on a metro-highway drive cycle but no official method for calculating PHEV fuel economy has yet been established.
5. The BEV mpg equivalent calculation is based on an energy calculation – i.e., the energy needed to move the vehicle is converted to a gasoline energy equivalent. This estimate is calculated based on a metro-highway drive cycle.
6. All estimates are based on a 13.5 gallon tank except for the BEV, which has no fuel tank.
7. "Well to Wheels" carbon dioxide (CO_2) includes all CO_2 emissions generated in the process of producing the fuel or electricity as well as the CO_2 emissions created by burning the fuel in the vehicle itself. It is useful to break this down into "Well to Tank" emissions, which measure the CO_2 emissions generated by excavating the feedstocks and producing and distributing the fuel or electricity, and "Tank to Wheels" emissions, which include the CO_2 generated by burning the fuel in the vehicle. These CO_2 calculations are estimates based on the metro-highway drive cycle and energy use for electric vehicles. However, official methods for calculating CO_2 emissions from PHEVs and BEVs have not yet been defined.
8. In vehicles using internal-combustion engines, the fuel feedstock is assumed to be petroleum.
9. In micro-hybrid vehicles, the fuel feedstock is assumed to be petroleum.
10. In HEVs, the fuel feedstock is assumed to be petroleum.
11. In PHEVs, the "Well to Tank" emissions are based on the percentage of emissions from petroleum fuel production and distribution and electric power generation, and the "Tank to Wheels" emissions are based on the percentage of time the vehicle is driven using petroleum-based fuel.
12. In BEVs, "Well to Tank" emissions include emissions related to electric-power generation, and "Tank to Wheels" emissions are zero, because no CO_2 is produced by running the vehicle on batteries charged with electrical power.
13. "Current grid" assumes average current emissions from U.S. power generation.
14. "Future grid" assumes use of 100% natural gas to generate electricity. Future grid emissions could be higher or lower than this value depending on the mix of fuels used to generate electricity.
15. Based on 12,000 miles/year, 30 mpg and $3/gallon.

16. Based on 12,000 miles/year, 32 mpg and $3/gallon.
17. Based on 12,000 miles/year, 45 mpg and $3/gallon.
18. Based on 12,000 miles/year, 75 percent in electric mode at 3.6 miles/kWh and 10 cents/kWh, and 25 percent in gasoline-engine mode at 50 mpg and $3/gallon.
19. Based on 12,000 miles/year, 3.6 miles/kWh and 10 cents/kWh.
20. Based on the purchase price without any possible government incentives such as tax credits.

Electrification: A Closer Look

MATERIAL ISSUES
Materiality Analysis
Climate Change
Greenhouse Gas Emissions Overview
Climate Change Risks and Opportunities
Blueprint for Sustainability: An Overview
Sustainable Technologies and Alternative Fuels Plan
Progress and Performance
Climate Change Policy and Partnerships
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Electrification Issues and Challenges

The electrification of vehicles has potential sustainability and cost advantages, but a range of issues must be addressed to realize this potential. Vehicle and fuel technologies interact in a complex system that includes vehicle technologies, battery technologies, fuel types and energy generation technologies, all of which determine the potential impacts on the environment and energy security. A total life-cycle view is needed to inform the best long-term decisions.

Costs and Savings

The current cost of plug-in vehicles is substantially higher than that of conventional vehicles, largely due to the cost of batteries. A study by the Boston Consulting Group projected that in 2020, even after costs have come down, a battery for an electric car with an 80-mile range will still cost about $14,000. Depending on electricity costs, however, the fuel cost for an all-electric car is in the range of 2 to 3 cents per mile, compared to about 8 to 10 cents[1] per mile for a conventional gasoline-powered vehicle. So, lower operating costs can help offset the higher initial costs of EVs.

Automakers will need to invest billions of dollars to develop next-generation electrification technologies and electrified vehicles. Governments will also need to invest by encouraging and facilitating the development of technology and infrastructure and providing incentives for consumers to buy EVs.

Battery Technology

Current-generation HEVs run on nickel metal hydride batteries, which offer significant improvements over traditional lead-acid batteries. For example, nickel metal hydride batteries deliver twice the power output for the weight compared to lead-acid batteries. Nickel metal hydride batteries have worked well in non-plug-in hybrids, which are designed to allow for constant discharging and recharging and are not expected to store and provide large amounts of energy. These batteries are reaching the end of their advancement potential, however, and new battery technologies are needed to improve on the current generation of HEVs.

PHEVs and BEVs make significant additional demands on battery technology. Unlike HEVs, PHEVs are designed to maximize battery usage for optimum fuel economy, and BEVs are designed to run solely on battery power. The batteries used in PHEVs and BEVs must function well in a wide range of conditions; tolerate running until nearly depleted and then being fully charged; store and provide a lot of power; last a minimum of 10 years or 150,000 miles; and, ideally, be compact and lightweight.

Automakers are moving toward lithium-ion batteries for next-generation HEVs and for PHEVs and BEVs. These batteries have greater energy density and are lighter in weight than nickel metal hydride batteries However, the technology is still evolving, and costs must drop considerably before they can be widely used (see Battery Evolution).

It is also important to develop adequate recycling programs for batteries at the end of their useful lives.

Battery Evolution

Battery technology is evolving. This comparison shows how new battery technology, such as the nickel metal hydride batteries in today's Hybrid Electric Vehicles (HEVs) and the lithium-ion battery technology of next-generation electrified vehicles compare to the traditional 12-volt lead-acid battery.

	Lead-Acid	Nickel Metal Hydride (Ni-MH)	Lithium-Ion (Li-ion)
First Commercial Use	1859	1989	1991
Current Automotive Use	Traditional 12-volt batteries	Battery technology developed for today's generation of hybrid vehicles	Under development for future hybrid electric and battery electric vehicles
Strengths	▪ Long proven in automotive use	▪ Twice the energy for the weight as compared to lead-acid ▪ Proven robustness	▪ About twice the energy content of Ni-MH and better suited to future plug-in electrified vehicle applications ▪ By taking up less space in the vehicle, provides far greater flexibility for automotive designers
Weaknesses	▪ Heavy; its lower energy-to-weight ratio makes it unsuitable for electrified vehicle usage	▪ High cost (four times the cost of lead-acid); limited potential for further development	▪ Although proven in consumer electronics, this technology is still under development for automotive applications ▪ Expensive until volume production is reached
Specific Energy (Watt hours per kilogram)	30–40	65–70	100–150
Recyclability	Excellent	Good	Very Good

Recharging

To maximize their all-electric range, plug-in vehicles must be charged regularly (every 30 to 50 miles of electric-powered driving, with current technology). They can be charged using standard household electric current but charge faster with higher-voltage electric service. Since electricity supplies are ubiquitous in developed countries, much of the needed infrastructure already exists, but new charging facilities will be required in public places as well as apartments and homes that lack accessible places to plug in. Other recharging options under consideration include battery-swap stations and inductive charging, where batteries are charged without a plug through "wireless recharge." This latter type of recharging could occur in special parking spots or even in "charging lanes" that could be included in roadways in the future.

Another focus of research is on rapid-charging technologies. Ideally, an electric vehicle could be charged in the same amount of time it takes to fill a fuel tank. At this time, rapid-charging typically shortens the life of a battery, but efforts are underway to develop cell technologies capable of rapid recharge in the future.

These and other charging options are all under consideration. Having an understanding of these technologies and how they may develop will be important to making electrified vehicles practical and affordable.

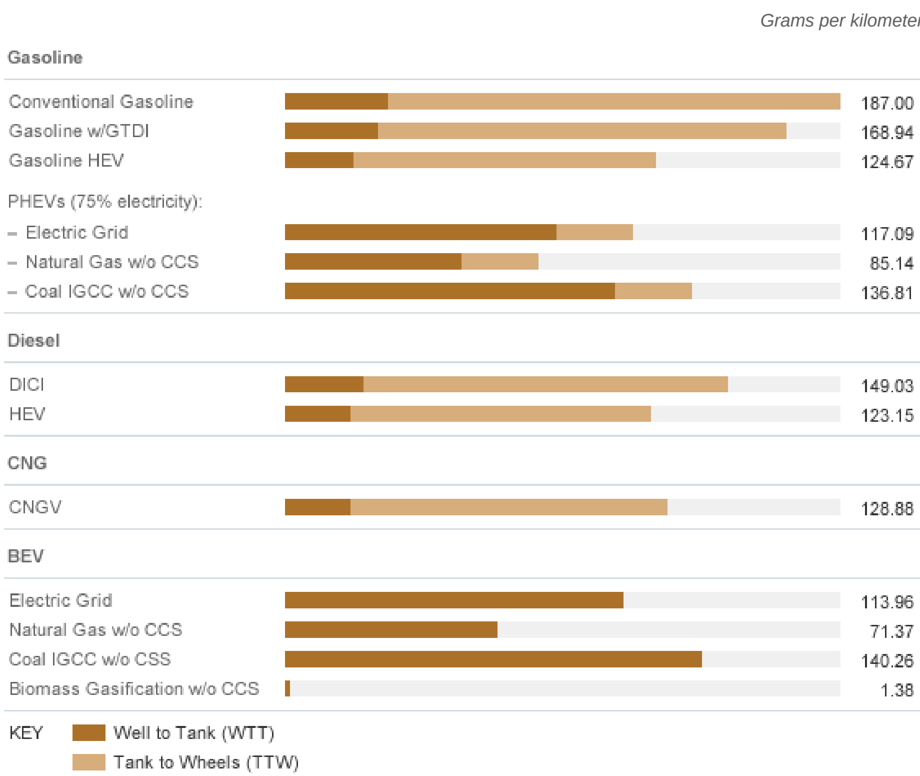
Environmental Benefits

Full BEVs are considered "zero emission" because they don't release greenhouse gases or other pollutants during use. But that term can be misleading: Operating an electric vehicle does cause emissions, but the location of the emissions is shifted from the vehicle to the power plant. A PHEV or BEV run on the current mix of power sources in the U.S. electrical power grid, for example, has no significant emissions advantages over an HEV. The reduction in vehicle fuel consumption resulting from the operation of a BEV or PHEV does result in a proportional reduction in those pollutants generated by burning petroleum fuel in the vehicle itself. However, replacing gasoline with electricity generated from coal, for example, would have limited emissions benefits, as the burning of coal to produce electricity generates carbon dioxide and other emissions such as nitrous oxides, sulfur dioxide, volatile organic compounds, carbon monoxide and particulate matter.

Thus, the promise of electrification is most fully realized when vehicles are powered by clean – ideally renewable – sources of electricity, which would reduce emissions substantially. To truly reap environmental benefits through the electrification of the transportation sector, the power-generation sector must act quickly to clean up emissions from the existing power grid. This would require a shift away from coal-based electricity to natural gas, renewables and other cleaner-burning alternatives, and/or the rapid development and deployment of carbon-sequestration technology.

WTW Fossil CO_2 Emissions for 2010 Compact-Size Vehicle

Chart | Table



	WTT	TTW	WTW
Gasoline			
Conventional Gasoline	34.86	152.15	187.00
Gasoline w/GTDI	31.49	137.45	168.94
Gasoline HEV	23.24	101.43	124.67
PHEVs (75% electricity)			
– Electric Grid	91.37	25.73	117.09
– Natural Gas w/o CCS	59.42	25.73	85.14
– Coal IGCC w/o CCS	111.09	25.73	136.81
Diesel			
DICI	26.32	122.71	149.03
HEV	21.75	101.40	123.15
CNG			
CNGV	21.98	106.89	128.88
BEV			
Electric Grid	113.96	0.00	113.96
Natural Gas w/o CCS	71.37	0.00	71.37
Coal IGCC w/o CCS	140.26	0.00	140.26
Biomass Gasification w/o CCS	1.38	0.00	1.38

Note that the numbers are not precise and are shown for directional purposes only. Abbreviations: GTDI – gasoline turbo with direct injection, or EcoBoost™; CCS – carbon capture and storage; IGCC – integrated gasification combined cycle; DICI – direct injection and compression ignition; CNGV – compressed natural-gas vehicle; HEV – hybrid electric vehicle; PHEV – plug-in hybrid electric vehicle; BEV – battery electric vehicle.

Since demand for electricity fluctuates (generally peaking in the afternoon and dropping off at night), utilities typically use a mix of fuels and power plant types to meet demand. That means that the environmental impacts of electric vehicle use will vary depending on where and when they are charged. During certain seasons and times of day, utilities may have excess capacity. Charging PHEVs and BEVs at those times can increase the overall efficiency of the electric grid. But if PHEVs and BEVs are charged at peak times, that could create demand for additional power plants. Utilities have a role to play in educating electrified-vehicle users and providing them with incentives to charge their vehicles at the most beneficial time. The development of "smart grid" technologies, which can provide utilities and customers with more real-time information on energy use and energy prices, is another key enabler of efficient electric vehicle charging and energy consumption.

An intriguing possibility is that the batteries in electric vehicles could be used to store excess electricity, helping to smooth the peaks and valleys of production. They also could be charged with electricity from small individual generation units, such as household solar electric and wind power systems. Then the renewable electricity stored in the vehicle battery could be provided to the electric grid when needed.

With all these variables, utilities will be key partners in defining and developing electricity supply systems for EVs that are efficient, affordable and environmentally sound. That's why Ford has partnered with Southern California Edison, the Electric Power Research Institute and a number of other utilities for its PHEV pilot program (described in Ford's Electrification Strategy).

1. Assuming an energy consumption of about 3 to 4 miles/kWh at 10 cents/kWh for the electric vehicle, and a fuel economy of 30–40 miles/gallon at $3/gallon for the gasoline vehicle.

Electrification: A Closer Look

IN THIS SECTION

Ford's Electrification Strategy

Ford's electrification strategy foresees a future that includes different types of electrified vehicles, depending on customers' needs. There will not be a one-size-fits-all approach, but a more diverse, smart application of different types of electrified vehicle technologies.

New Vehicles Coming to Market

Ford already offers four hybrid electric vehicles: The Ford Escape and Mercury Mariner Hybrids and, beginning in early 2009, the Ford Fusion and Mercury Milan Hybrids. These HEVs are ideal for customers who drive a range of distances in varied driving conditions. Their most significant benefits come under urban stop-and-go driving conditions.

We recently announced plans to introduce two BEVs. We will introduce a BEV version of the Transit Connect utility van, targeted at commercial markets, in 2010. We are developing this vehicle in partnership with Smith Electric Vehicles, the European market's leading battery-electric adapter of commercial vehicles. In 2011, we will introduce a Focus BEV, developed in partnership with Magna International. Both of these BEVs will be ideal for customers who routinely travel relatively short distances between charges.

We are also planning to introduce a PHEV commercially in 2012, along with our next-generation HEV technology. We already have a test fleet of PHEVs on the road in partnership with a number of utility companies.

Ford plans to introduce its electrified vehicles in North America first and, based on that experience, will consider expanding the availability of the products to Europe and Asia as well.

Because the platforms on which these future Ford products will be based are global, they offer tremendous opportunities for production economies of scale. That's key to reducing the cost of components that would be too expensive in lower-volume production, especially lithium-ion battery technology.

Collaborative Approach

Gearing up for the infusion of these new technologies will be a global challenge. Major advances have already been made on the electrical technology at the core of the next-generation electrified vehicles, and there's more to come. In Ford's vision, a coalition of automotive manufacturers and other stakeholders will work together to develop technologies, standards and cost efficiencies to commercialize electrified vehicles. It will take a collaborative approach of automakers, suppliers, fuel producers and utilities, educators and researchers, and policy makers and opinion shapers to help us make the transition and realize the full benefits of electrification.

Traditional automotive suppliers transforming themselves for electrification are being joined by new suppliers adapting electronics to the automotive environment. Significant possibilities exist for innovation in battery technology, power electronics and the development of motors, generators, high-voltage systems and other components.

Ford's plan calls for strategic partnering with key suppliers who bring technical expertise, financial solidity and collaborative spirit. We believe that working with a range of partners will allow us to gain greater understanding of the connectivity of vehicles to the electric grid, promote the necessary infrastructure and bring down the costs of the technology to make it more accessible for consumers. As

RELATED LINKS

Vehicle Web Sites:
Ford Escape Hybrid
Mercury Mariner Hybrid
Ford Fusion/Fusion Hybrid
Mercury Milan Hybrid

External Web Sites:
Electric Power Research Institute

DOWNLOADS

Electrification Fact Sheets (pdf, 3.38Mb)

mentioned above, for example, we are partnering with Magna International to develop our small sedan BEV and with Smith Electric Vehicles to develop a BEV version of our Transit Connect commercial utility van. We have also begun collaborating with other stakeholders, such as electrical utility companies, who will be central to the electrified vehicle experience of the future. We are working with a number of electric utilities and industry groups to understand how to make these vehicles work most effectively for our customers and within the current electrical system. These partners include the Electric Power Research Institute, the New York State Energy Research and Development Authority, and utilities including American Electric Power, ConEdison, DTE Energy, National Grid, New York Power Authority, Progress Energy and Southern Company-Alabama Power.

Ford is working with researchers at the University of Michigan and the Massachusetts Institute of Technology to develop and test improved lithium-ion battery technology. This research is funded in part by a $55 million tax credit incentive Ford received from the Michigan Economic Development Corporation.

Ford is also exploring a possible "eco-partnership" in China to expand its global expertise with electric-powered vehicles. Ford, Changan Auto Group and the cities of Chongqing, China, and Denver, Colorado, are exploring ways to develop projects to help further energy security and promote economic and environmental sustainability. Areas of focus could include developing electrified vehicle technologies, green city planning, efficient urban transportation and grid integration.

For more details on our electric vehicle technologies and other fuel efficiency, advanced powertrain and alternative fuels technologies, please see the Sustainable Technologies and Alternative Fuels Plan.