# Material Issues



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In this section, we discuss our most important sustainability issues and how they were identified. We also present perspectives on key issues from external and internal experts.

## Materiality Analysis

Ford uses a rigorous materiality analysis to prioritize key sustainability issues.

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## Climate Change

We're cutting greenhouse gas emissions from our products and operations and pursuing sound climate policies.

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## Mobility

By understanding our customers' and society's changing needs, we can help develop new models of sustainable mobility.

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## Human Rights

We're working with our suppliers and other automakers to promote human rights in the global automotive supply chain.

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## Vehicle Safety

We're delivering innovations in vehicle safety and promoting road safety in mature and emerging markets.

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## Sustaining Ford

In a tough economic climate, we're working to improve our financial performance and competitiveness.

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## Perspectives on Sustainability

Experts from Ford and other institutions offer their perspectives on our key sustainability issues.

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# Materiality Analysis



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For its 2008/9 Sustainability Report, Ford conducted a streamlined update of its materiality analysis, adding key inputs (such as the December 2008 Report to Congress), replacing outdated inputs and gathering feedback from internal experts and the Ceres Stakeholder Committee.

The results are largely similar to the previous analysis. Two groups of material issues – those pertaining to Ford's financial viability and climate change/fuel economy – would have moved up in priority to Ford and stakeholders if they were not already at the highest level.

However, some new issues emerged, some dropped out and others were recast or reorganized. Changes to the most material issues (upper-right part of the materiality matrix) included the following:

- In the financial viability grouping, labor costs, access to capital, the threat of competitor bankruptcy, and dealer and supplier viability were added as new issues.
- In the climate change grouping, low-carbon fuels replaced "clean/alternative fuels," reflecting a sharper focus on the life-cycle carbon emissions of fuels. Ford's electrification strategy was added as an issue, and emissions trading/cost of carbon emerged as a separate issue formerly subsumed within the low-carbon strategy issue.
- Urban mobility was added as an issue under mobility and emerging markets, as the unique characteristics of urban areas present challenges for traditional models of personal mobility and opportunities to develop new products and services.

Other changes included the addition of health care reform as a public policy issue and hazardous pollutants as an operational environmental issue, and a higher level of importance to Ford assigned to the congestion issue.

We have used this analysis to identify issues to cover in our reporting and as an input to our sustainability strategy development.

## Materiality Matrix

Our interactive materiality matrix categorizes issues according to their concern to stakeholders and their current or potential impact on the Company.

VIEW THE MATERIALITY MATRIX

# Materiality Matrix

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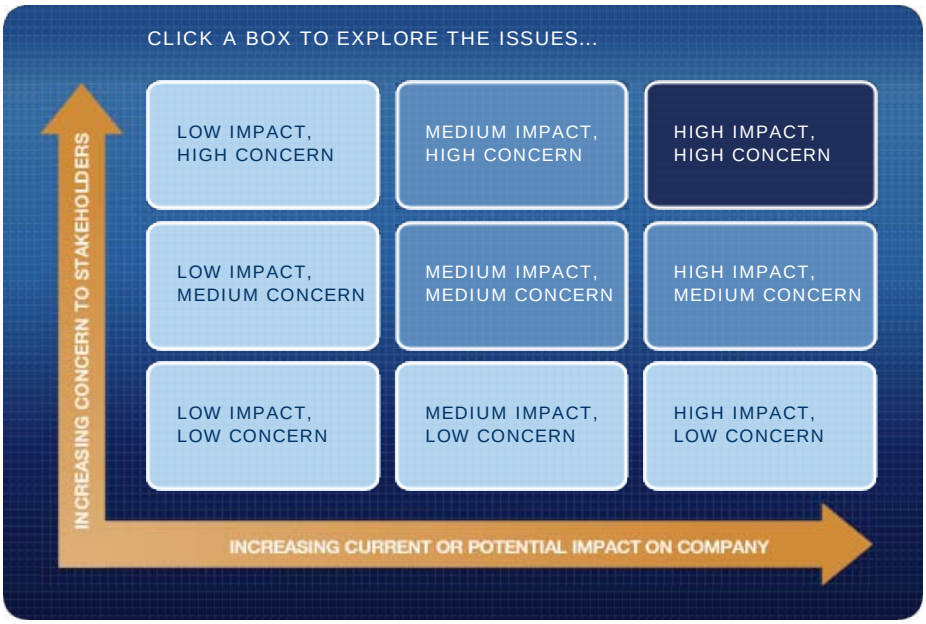
Below is our interactive materiality matrix. In it, issues are categorized according to their concern to stakeholders and their current or potential impact on the Company. Click each box to see which issues are categorized within each sector.

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Click on the boxes in the navigator (right) to explore each level, and click on individual issues below to see details.

Ratings of control or influence reflect Ford's contribution to an issue through its operations and product offerings. Factors that can reduce Ford's control or influence include, among other things, technology limitations, costs and consumer demand.

## High Current or Potential Impact on Company

## High Concern to Stakeholders

23 material issues have been identified at this level (click on an issue for more details).

| | LEVEL OF CONTROL OR INFLUENCE: LOW | MEDIUM | HIGH |
|---|---|---|---|
| Ford Financial Viability | Competitor and Supplier Viability | Profitability Level and Timing<br>Alignment of Products with Demand<br>Health Care and Legacy Costs<br>Labor Costs<br>Access to Capital – Private and Government<br>Dealer Viability | Quality<br>Managing Downsizing |
| Climate Change | Low-Carbon Fuels<br>Emissions Trading/Cost of Carbon<br>Energy Security | Vehicle GHG Emissions<br>Advanced Clean Vehicle Technology | Low-Carbon Strategy<br>Fuel Economy<br>Electrification Strategy |
| Public Policy | | Greenhouse Gas/Fuel Economy Regulations | |
| Safety | | Vehicle Safety | |
| Human Rights | | Other Issues | Supply Chain Practices |
| Mobility and Emerging Markets | Urban Mobility | | Emerging Market Products and Services Strategy |

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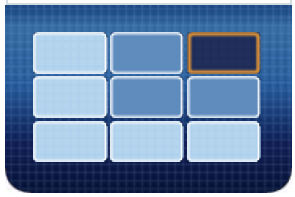

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## Medium Current or Potential Impact on Company

## High Concern to Stakeholders

Two material issues have been identified at this level (click on an issue for more details).

LEVEL OF CONTROL OR influence

| | LOW | MEDIUM | HIGH |
|---|---|---|---|
| Community | | | Community Engagement<br>Community Impacts and Contributions |

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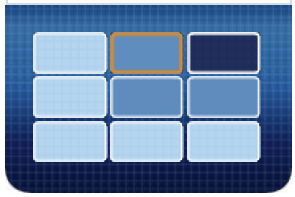

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## Medium Current or Potential Impact on Company

## Medium Concern to Stakeholders

10 material issues have been identified at this level (click on an issue for more details).

LEVEL OF CONTROL OR INFLUENCE

| | LOW | MEDIUM | HIGH |
|---|---|---|---|
| Governance | | | Shareholder Concerns |
| Operations | | | Operational Environmental Management/Environmental Compliance<br>Hazardous Pollutants |
| Product | | End of Life Management | Marketing Communications/Demand Creation/Advertising |
| Workplace | | | Employees/Labor Practices/Decent Work<br>Diversity/Equal Opportunity |
| Mobility and Emerging Markets | | Emerging Market Vehicle and Road Safety | |
| Public Policy | Health Care Reform | | Political Payments and Contributions |

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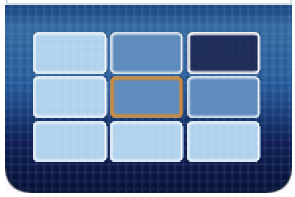

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## High Current or Potential Impact on Company

## Medium Concern to Stakeholders

12 material issues have been identified at this level (click on an issue for more details).

LEVEL OF CONTROL OR INFLUENCE

| | LOW | MEDIUM | HIGH |
|---|---|---|---|
| Ford Financial Viability | | | Manufacturing Efficiency |
| Sustainablity Strategy | | | Sustainability Vision, Governance and Management |
| Governance | | | Ethical Business Practices |
| Public Policy | | Global Environmental Regulation | |
| Operations | | | Energy Use<br>Water Use<br>GHG Emissions |
| Product | | | Tailpipe Emissions<br>Sustainable Materials<br>Product Compliance |
| Moblity and Emerging Markets | Congestion | | |
| Workplace | | | Health and Safety |

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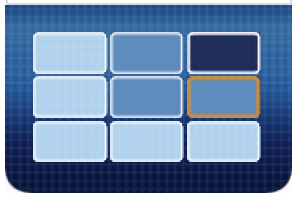

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## Low Current or Potential Impact on Company

## High Concern to Stakeholders

No issues have been identified at this level.

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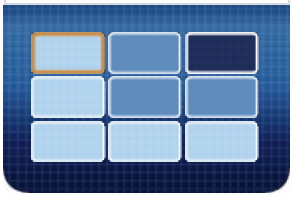

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## Low Current or Potential Impact on Company

## Medium Concern to Stakeholders

Three issues have been identified at this level.

LEVEL OF CONTROL OR INFLUENCE

| | LOW | MEDIUM | HIGH |
|---|---|---|---|
| Operations | | | ▪ Land and Nature<br>▪ Other Environmental Issues: Spills, Nuisances |
| Product | | ▪ Noise | |

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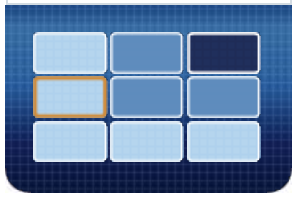

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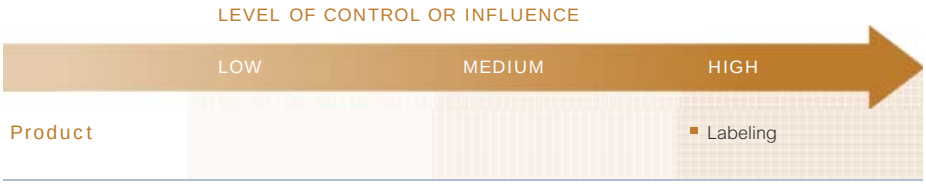
## Low Current or Potential Impact on Company
## Low Concern to Stakeholders

One issue has been identified at this level.

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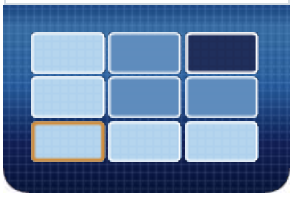

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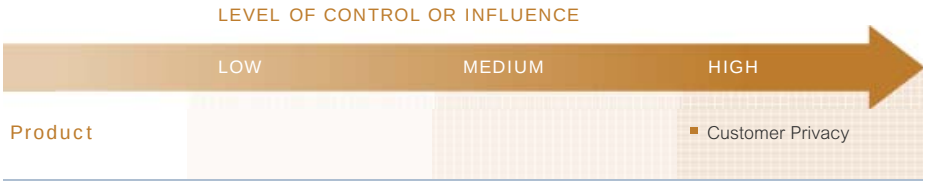
## Medium Current or Potential Impact on Company

## Low Concern to Stakeholders

One issue has been identified at this level.

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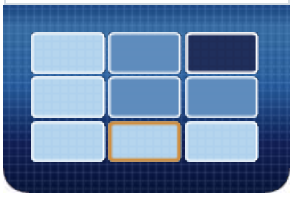

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## High Current or Potential Impact on Company

## Low Concern to Stakeholders

Five issues have been identified at this level.

LEVEL OF CONTROL OR INFLUENCE

| | LOW | MEDIUM | HIGH |
|---|---|---|---|
| Ford Financial Viability | ▪ Commodity Costs | | |
| Operations | | | ▪ Non-GHG Emissions<br>▪ Waste Generation and Management |
| Workplace | | | ▪ Employee Morale and Teamwork |
| Supply Chain | | ▪ Supplier Environmental Sustainability | |

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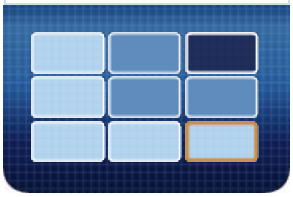

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Competitor and Supplier Viability

| | |
|---|---|
| Definition/Description | Potential disruptions to supply base due to competitor or supplier bankruptcies |
| Comments | Concerns about bankruptcy of competitors a new and major concern |
| Trend (from previous analysis) | NEW |
| Level of control or influence | Low |
| More information | ■ Sustaining Ford<br>■ Suppliers<br>■ Working with Suppliers |

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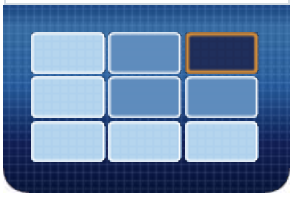

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Profitability Level and Timing

| | |
|---|---|
| Definition/Description | Broad concerns about Ford's financial performance and future |
| Comments | A top concern for Ford and stakeholders |
| Trend (from previous analysis) | Already at the highest level |
| Level of control or influence | Medium |
| More information | Letter from Alan Mulally<br>Sustaining Ford<br>Economy |

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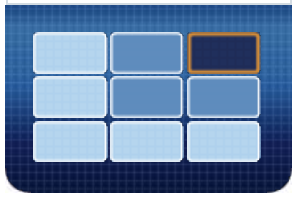

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Alignment of Products with Demand

| | |
|---|---|
| Definition/Description | Ford's realignment of production capacity to lower levels of demand and the shift from trucks and SUVs to cars; supply-base rationalization |
| Comments | New issue (formerly included in several others) of great concern to Ford and stakeholders, particularly investors |
| Trend (from previous analysis) | NEW |
| Level of control or influence | Medium |
| More information | ▪ Sustaining Ford<br>▪ Delivering New Products<br>▪ Lewis Booth |

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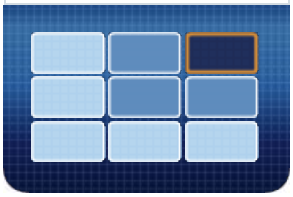

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Health Care and Legacy Costs

| | |
|---|---|
| Definition/Description | Ford's U.S. cost to provide health care coverage for current employees; health care and pension for retirees; Ford's participation in health care public policy formulation. Significant competitive issue as foreign manufacturers in U.S. have few retirees; may not provide health care to employees in home markets |
| Comments | High concern to investors; increasing awareness/concern to customers and general public |
| Trend (from previous analysis) | Already at the highest level |
| Level of control or influence | Medium |
| More information | Focusing on Labor Costs<br>Working with the UAW<br>Health as a Strategic Advantage<br>HIV/AIDS |

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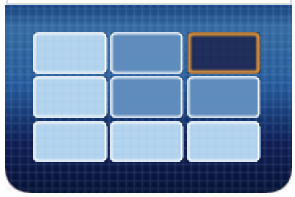

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Labor Costs

| | |
|---|---|
| Definition/Description | Cost structure including hourly wages, benefits, post-retirement benefits; effect on competitiveness |
| Comments | Have become a higher-profile issue since they figured in Congressional debate over aid to U.S. automakers |
| Trend (from previous analysis) | NEW |
| Level of control or influence | Medium |
| More information | ■ Focusing on Labor Costs<br>■ Restructuring Our Business<br>■ Financing Our Plan |

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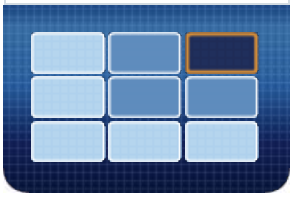

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Access to Capital – Private and Government

| | |
|---|---|
| Definition/Description | Includes impact of credit crisis on availability of private capital and potential need for government loans |
| Comments | New issue |
| Trend (from previous analysis) | NEW |
| Level of control or influence | Medium |
| More information | ■ Sustaining Ford<br>■ Financing Our Plan |

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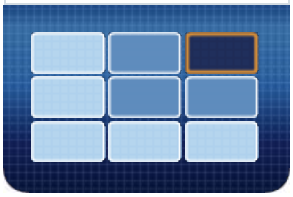

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Dealer Viability

| | |
|---|---|
| Definition/Description | Size of dealer network; profitability and creditworthiness of dealers |
| Comments | "Dealer relationships" issue redefined as viability due to mismatch of number of dealers with vehicle demand |
| Trend (from previous analysis) | NEW |
| Level of control or influence | Medium |
| More information | ■ Sustaining Ford<br>■ Dealers<br>■ Working with Dealers |

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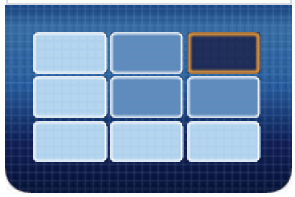

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## High Current or Potential Impact on Company

## High Concern to Stakeholders

### Quality

| | |
|---|---|
| Definition/Description | Product quality and customer service/customer relationship management |
| Comments | Growing recognition of Ford's dramatic quality improvements, but still a key factor in financial viability |
| Trend (from previous analysis) | Already at the highest level |
| Level of control or influence | High |
| More information | Economy: Progress<br>Customer Satisfaction and Quality |

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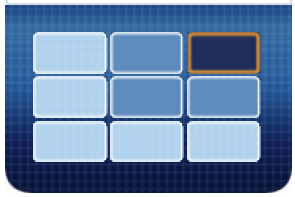

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## High Current or Potential Impact on Company

## High Concern to Stakeholders

## Managing Downsizing

| | |
|---|---|
| Definition/Description | Financial impacts on company and business partners; availability of funding for restructuring; employee morale; community impacts of plant closures; managing EH&S impacts of downsizing |
| Comments | Continued cutbacks present challenges to Ford, employees, dealers, communities and investors |
| Trend (from previous analysis) | Already at the highest level |
| Level of control or influence | High |
| More information | Handling Downsizing Responsibly<br>Restructuring Our Business<br>Society: Progress<br>Employees<br>North American Restructuring<br>Community |

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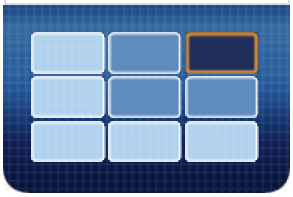

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## High Current or Potential Impact on Company

## High Concern to Stakeholders

### Low-Carbon Fuels

| | |
|---|---|
| Definition/Description | Redefinition of clean/alternative fuel issue. Includes renewably produced fuels, biofuels. Sub-issues include infrastructure, fuel availability and cost, competition between food and fuel |
| Comments | Increasing focus on life-cycle carbon footprint of fuels, indirect effects like land use changes due to biofuel production |
| Trend (from previous analysis) | Already at the highest level |
| Level of control or influence | Low |
| More information | Fuel<br>Sustainable Technologies and Alternative Fuels Plan<br>U.S. Climate Change Legislation<br>Electrification: A Closer Look |

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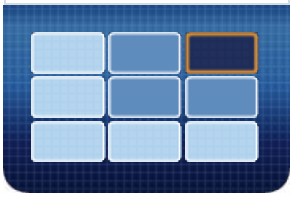

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## High Current or Potential Impact on Company

## High Concern to Stakeholders

## Emissions Trading/Cost of Carbon

| | |
|---|---|
| Definition/Description | Ford's participation in carbon markets and strategic response to cost of carbon |
| Comments | New issue reflecting establishment of carbon markets in some regions and likely future establishment in others |
| Trend (from previous analysis) | NEW |
| Level of control or influence | Low |
| More information | Emissions Trading |

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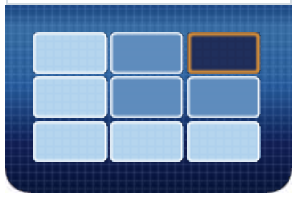

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## High Current or Potential Impact on Company

## High Concern to Stakeholders

## Energy Security

| | |
|---|---|
| Definition/Description | Concerns about the stability of energy supplies, particularly oil from politically unstable regions; development of supplies within national boundaries |
| Comments | Volatility in fuel prices has reinforced concerns, particularly in the U.S.; a driver of interest in alternative fuels including ethanol/E85 and electrification |
| Trend (from previous analysis) | Already at the highest level |
| Level of control or influence | Low |
| More information | Letter from Alan Mulally<br>Climate Change Risks and Opportunities<br>Fuel<br>Electrification: A Closer Look |

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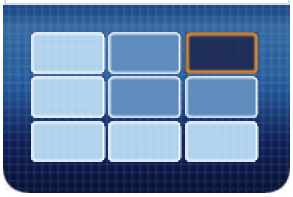

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## High Current or Potential Impact on Company

## High Concern to Stakeholders

## Vehicle GHG Emissions

| | |
|---|---|
| Definition/Description | Ford's product actions to meet its $CO_2$ target |
| Comments | Increasingly driven by regulatory requirements as well as Ford's voluntary product $CO_2$ goal; of increasing interest to government and investors |
| Trend (from previous analysis) | Already at the highest level |
| Level of control or influence | Medium |
| More information | Climate Change<br>Vehicle<br>Letter from Alan Mulally<br>Fuel Economy and Greenhouse Gas Emissions<br>Environment: Progress |

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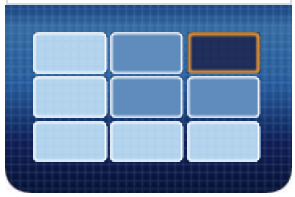

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## High Current or Potential Impact on Company

## High Concern to Stakeholders

## Advanced Clean Vehicle Technology

| | |
|---|---|
| Definition/Description | Ford's development of low-carbon technologies, including hybrids, electric vehicles, clean diesel, fuel cells; also emerging technologies like nanotechnology |
| Comments | High customer/NGO interest in technologies but also concerns over cost and infrastructure |
| Trend (from previous analysis) | Greater customer awareness of technology options |
| Level of control or influence | Medium |
| More information | Sustainable Technologies and Alternative Fuels Plan<br>Vehicle<br>Delivering More Fuel-Efficient Vehicles<br>Products |

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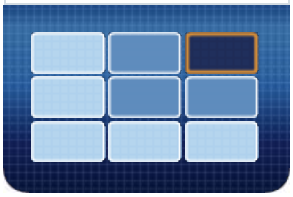

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Low-Carbon Strategy

| | |
|---|---|
| Definition/Description | Ford's strategy to reduce carbon emissions from products and operations; goals and targets; use of renewable energy and offsets |
| Comments | Strongly related to other material issues; of increasing interest to government and investors |
| Trend (from previous analysis) | Already at the highest level |
| Level of control or influence | High |
| More information | Climate Change<br>Blueprint for Sustainability: An Overview<br>Environment<br>Delivering New Products<br>Electrification: A Closer Look<br>Operational Energy Use and Greenhouse Gas Emissions |

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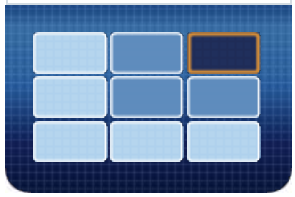

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## High Current or Potential Impact on Company

## High Concern to Stakeholders

## Fuel Economy

| | |
|---|---|
| Definition/Description | Global issue, but particular focus on Ford U.S. fleet |
| Comments | Increasingly driven by regulatory requirements as well as Ford's voluntary product $CO_2$ goal; of increasing interest to government and investors |
| Trend (from previous analysis) | Already at the highest level |
| Level of control or influence | High |
| More information | ■ Fuel Economy and Greenhouse Gas Emissions<br>■ Environment: Progress<br>■ Design for Life-Cycle Sustainability<br>■ Delivering More Fuel-Efficient Vehicles<br>■ Letter from Alan Mulally<br>■ Greenhouse Gas Emissions Overview<br>■ Climate Change Risks and Opportunities<br>■ Blueprint for Sustainability: An Overview<br>■ Sustainable Technologies and Alternative Fuels Plan |

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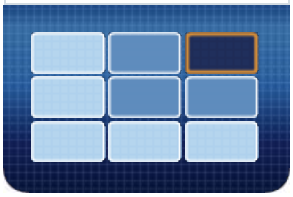

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## High Current or Potential Impact on Company

## High Concern to Stakeholders

## Electrification Strategy

| | |
|---|---|
| Definition/Description | Ford's strategy to deliver electric vehicles to the marketplace and work with partners to address infrastructure and utility interface issues |
| Comments | New issue reflecting interest in alternatives to fossil fuels and domestically produced energy |
| Trend (from previous analysis) | NEW |
| Level of control or influence | High |
| More information | ■ Migration to Alternative Fuels and Powertrains<br>■ Electrification: A Closer Look |

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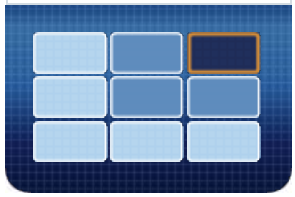

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Greenhouse Gas/Fuel Economy Regulation

| | |
|---|---|
| Definition/Description | Regulation of vehicle emissions globally, state-by-state regulation in U.S.; USCAP and likelihood of federal climate change legislation in U.S. |
| Comments | With passage of new CAFE requirements in U.S. and new EU requirements in Europe, focus is increasingly on economy-wide policy approaches. |
| Trend (from previous analysis) | Already at the highest level |
| Level of control or influence | Medium |
| More information | U.S. Climate Change Legislation<br>U.S. Greenhouse Gas and Fuel Economy Regulation<br>Incentives for Fleet Renewal<br>European Policy<br>Climate Change Risks and Opportunities<br>Emissions Trading<br>Greenhouse Gas Emissions Overview |

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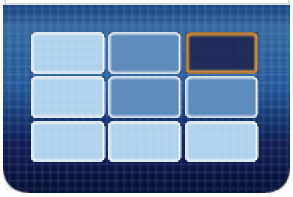

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Vehicle Safety

| | |
|---|---|
| Definition/Description | Active and passive safety; pedestrian safety; customer interest in and demand for safe vehicles; increasing regulation generally with focus on active safety; challenge of evolving in-vehicle technology |
| Comments | Developed and emerging market issues differ |
| Trend (from previous analysis) | Ford increasingly emphasizing market opportunity for safer products |
| Level of control or influence | Medium |
| More information | Vehicle Safety |

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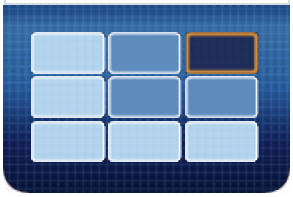

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Other Issues

| | |
|---|---|
| Definition/Description | Code for Ford facilities, HR practices in broader community; indigenous people; environmental justice |
| Comments | High interest to communities, NGOs |
| Trend (from previous analysis) | Already at the highest level |
| Level of control or influence | Medium |
| More information | Human Rights<br>Employees<br>Community<br>Mark Mittelhauser |

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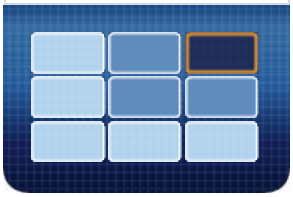

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Supply Chain Practices

| | |
|---|---|
| Definition/Description | Issues covered by Ford's working conditions code; need for industry cooperation |
| Comments | High interest to communities, suppliers, NGOs |
| Trend (from previous analysis) | Already at the highest level |
| Level of control or influence | High |
| More information | ■ Human Rights<br>■ Ford and the Automotive Industry Supply Chain<br>■ Collaboration within the Automotive Industry |

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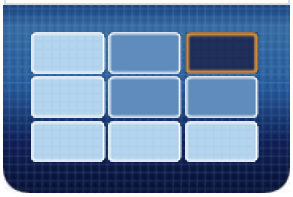

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Urban Mobility

| | |
|---|---|
| Definition/Description | Ford's product and services strategy for urban areas in developed and developing countries |
| Comments | New issue: Unique conditions in urban areas present challenges for traditional models of personal mobility and opportunities to develop new products and services |
| Trend (from previous analysis) | NEW |
| Level of control or influence | Low |
| More information | ■ Mobility<br>■ Bert Bras and Tina Guldberg |

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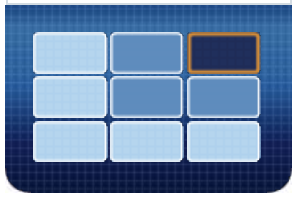

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**High Current or Potential Impact on Company**

**High Concern to Stakeholders**

## Emerging Markets Products and Services Strategy

| | |
|---|---|
| Definition/Description | Ford's approach to emerging markets: vehicles v. mobility services; base of the pyramid strategy; infrastructure development; Ford's target customer and position relative to emerging market OEMs; Ford's impacts/contributions in emerging markets (other than products and services), including local sourcing, pollution, potential for partnerships |
| Comments | Key drivers of the issue include congestion, shifting demographics, urbanization and social equity |
| Trend (from previous analysis) | Already at the highest level |
| Level of control or influence | High |
| More information | Mobility<br>Increasing Global Integration<br>Letter from William Clay Ford, Jr.<br>Letter from Alan Mulally<br>2008 Sales and Highlights |

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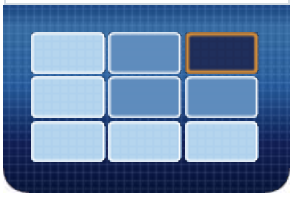

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## Medium Current or Potential Impact on Company

## High Concern to Stakeholders

## Community Engagement

| | |
|---|---|
| Definition/Description | License to operate, NGO relationships and specific community concerns like breast cancer, obesity, compliance |
| Comments | High concern to communities and NGOs |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Community<br>Society: Case Studies<br>Stakeholder Engagement |

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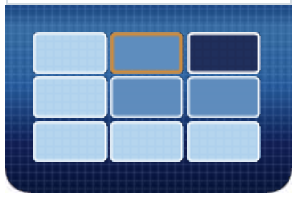

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## Medium Current or Potential Impact on Company

## High Concern to Stakeholders

## Community Impacts and Contributions

| | |
|---|---|
| Definition/Description | Encompasses a range of direct and indirect economic impacts, including local hiring and sourcing and philanthropic donations to the community; also local environmental impacts |
| Comments | High concern to communities |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Community<br>Human Rights<br>Sustaining Ford<br>Financial Recovery Plan<br>Manufacturing<br>Economic Impacts of the Auto Industry |

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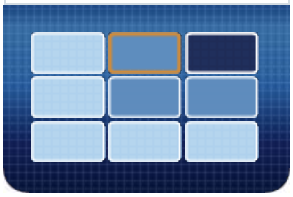

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## Medium Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Shareholder Concerns

| | |
|---|---|
| Definition/Description | Primarily concerns raised through shareholder resolutions |
| Comments | Rose in importance to Ford because of increasing focus on governance issues |
| Trend (from previous analysis) | Increased in importance to Ford |
| Level of control or influence | High |
| More information | Corporate Governance – Board of Directors<br>Stakeholder Engagement |

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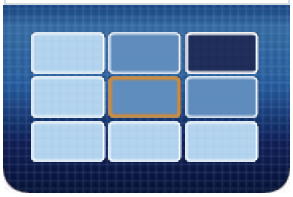

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## Medium Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Operational Environmental Management/Environmental Compliance

| | |
|---|---|
| Definition/Description | High-level environmental operation concerns, including environmental management; environmental compliance; sustainable production and consumption; tradeoffs between energy use and air quality (e.g., incineration of paint fumes) |
| Comments | Environmental compliance a concern to communities |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Sustainability Governance<br>Sustainability Management<br>Blueprint for Sustainability: An Overview<br>Environment<br>Compliance |

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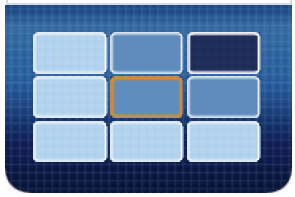

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## Medium Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Hazardous Pollutants

| | |
|---|---|
| Definition/Description | Hazardous substances in products, manufacturing and supply chain |
| Comments | Higher level of concern to Ford reflects increasing public interest |
| Trend (from previous analysis) | NEW |
| Level of control or influence | High |
| More information | ▪ Sustainable Materials<br>▪ Facilities-Related Emissions<br>▪ Waste Management<br>▪ Tailpipe Emissions<br>▪ Emissions (VOC and Other) |

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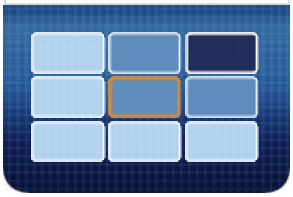

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## Medium Current or Potential Impact on Company

## Medium Concern to Stakeholders

## End of Life Management

| | |
|---|---|
| Definition/Description | Trend towards "extended producer responsibility;" waste; design for recyclability; health and safety issues at dismantling facilities |
| Comments | Less of a concern relative to other issues |
| Trend (from previous analysis) | Lower level of concern to Ford |
| Level of control or influence | Medium |
| More information | End of Life<br>Quantifying Our Environmental Impacts<br>Design for Life-Cycle Sustainability<br>Life-Cycle Vehicle $CO_2$ Emissions |

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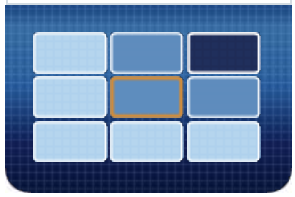

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## Medium Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Marketing Communications/Demand Creation/Advertising

| | |
|---|---|
| Definition/Description | Advertising and other communications with customers |
| Comments | Within Ford, primarily a compliance issue; for NGOs/multi-stakeholder groups, concern over whether Ford can only react to consumer desires or can lead them, e.g., toward more sustainable products |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Building Customer Awareness<br>Tracking Changing Customer Needs<br>Customers<br>Stakeholder Engagement |

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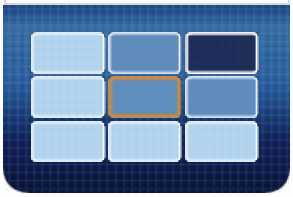

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## Medium Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Employees/Labor Practices/Decent Work

| | |
|---|---|
| Definition/Description | Ford's employment practices, including wages, wage ratios, benefits, permanent v. temporary positions; training and education; turnover; impact of aging workforce |
| Comments | High concern to communities and investors |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Employees<br>Human Rights<br>Restructuring Our Business |

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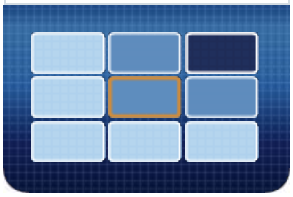

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## Medium Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Diversity/Equal Opportunity

| | |
|---|---|
| Definition/Description | Diversity of Ford Board and management; harassment programs and monitoring |
| Comments | Relatively high concern to NGOs/stakeholders who see diversity as global strategic issue |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Diversity and Inclusion in the Workplace<br>Corporate Governance – Board of Directors<br>Code of Basic Working Conditions<br>Engagement and Community |

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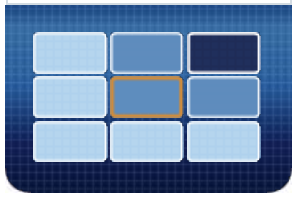

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## Medium Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Emerging Market Vehicle and Road Safety

| | |
|---|---|
| Definition/Description | Road safety as a public health issues: safety for motorists and non-car users; infrastructure; driver education |
| Comments | Increasing focus of Ford's outreach to customers |
| Trend (from previous analysis) | Increased in importance to Ford |
| Level of control or influence | Medium |
| More information | ▪ Vehicle Safety: Challenges and Opportunities<br>▪ Driving Environment<br>▪ Driving Skills for Life: Asia Pacific Expansion |

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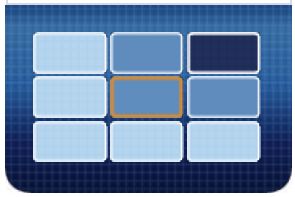

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## Medium Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Health Care Reform

| | |
|---|---|
| Definition/Description | Collaborative efforts to improve quality and reduce cost of health care; potential for legislative overhaul of U.S. health care system |
| Comments | Formerly subsumed in health care costs; identified as a separate issue due to its impact on Ford and new administration's commitment to reform |
| Trend (from previous analysis) | NEW |
| Level of control or influence | Low |
| More information | ▪ Working with the UAW<br>▪ Health as a Strategic Advantage |

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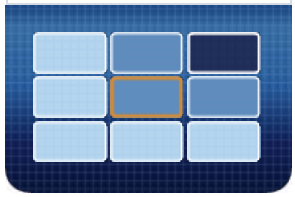

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## Medium Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Political Payments and Contributions

| | |
|---|---|
| Definition/Description | Company donations to candidates and campaigns; lobbying costs; employee Political Action Committee; indirect giving through trade associations, etc. |
| Comments | Stakeholders, including shareholders, are showing increasing interest and advocacy for "political accountability" or transparency around the various forms of corporate political donations |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Political Contributions<br>Policy Letters and Directives |

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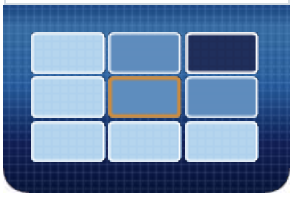

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## High Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Manufacturing Efficiency

| | |
|---|---|
| Definition/Description | Includes reduced complexity of products, lean and flexible manufacturing, flexible work rules |
| Comments | Key element of Ford's ability to respond to changing markets; part of public discussion about aid to automakers |
| Trend (from previous analysis) | NEW |
| Level of control or influence | High |
| More information | ■ Increasing Global Integration<br>■ Improving New Product Development Process |

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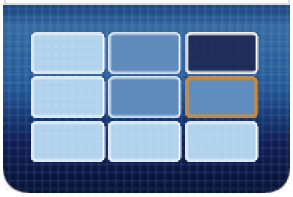

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## High Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Sustainability Vision, Governance and Management

| | |
|---|---|
| Definition/Description | Includes governance structures, goals and indicators, business case, stakeholder engagement, reporting |
| Comments | Governance added to vision and management, reflecting growing investor and NGO interest in integrating sustainability into business processes |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Letter from William Clay Ford, Jr.<br>Letter from Alan Mulally<br>Letter from Sue Cischke<br>Sustainability Governance<br>Sustainability Management<br>Sustainable Mobility Governance<br>Code of Basic Working Conditions<br>How We Manage Vehicle Safety<br>Environmental Management |

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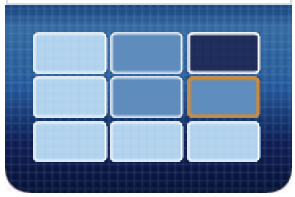

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## High Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Ethical Business Practices

| | |
|---|---|
| Definition/Description | Concerns covered by codes of conduct, e.g., corruption and anti-competitive behavior; also concerns about Board independence |
| Comments | Among stakeholders, of most concern to investors |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | ■ Ethical Business Practices<br>■ Corporate Governance – Board of Directors<br>■ Sustainability Governance |

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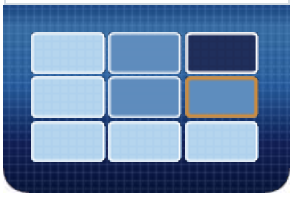

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## High Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Global Environmental Regulation

| | |
|---|---|
| Definition/Description | Trend toward greater regulation and the cost of compliance |
| Comments | Not a new issue but now under a "public policy" heading |
| Trend (from previous analysis) | Same position |
| Level of control or influence | Medium |
| More information | Climate Change Risks and Opportunities<br>Climate Change Policy and Partnerships |

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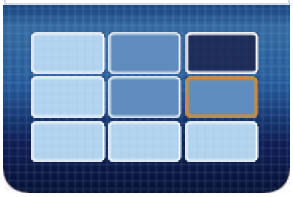

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## High Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Energy Use

| | |
|---|---|
| Definition/Description | Operations/facilities: concerns about cost and availability; energy security |
| Comments | High concern to communities |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Environment: Progress<br>Operations<br>Environment: Case Studies<br>Operational Energy Use and $CO_2$ Emissions |

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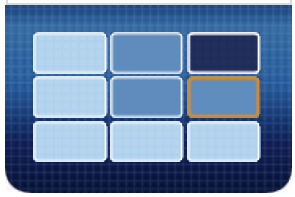

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## High Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Water Use

| | |
|---|---|
| Definition/Description | Includes impacts on water sources; water management, cost of water and discharges to water |
| Comments | Particular concern in areas of water scarcity; issue gaining a higher public profile |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Environment: Progress<br>Water Use<br>Environment Data: Water Use |

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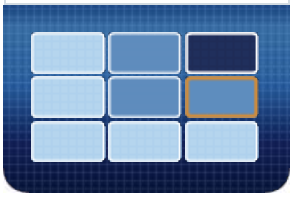

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## High Current or Potential Impact on Company

## Medium Concern to Stakeholders

## GHG Emissions

| | |
|---|---|
| Definition/Description | Includes cost of controlling GHG emissions |
| Comments | Less of a concern than GHG emissions from vehicles, but rated high for Ford and NGOs/stakeholders |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Greenhouse Gas Emissions Overview<br>Environment: Progress<br>Blueprint for Sustainability: An Overview<br>Operational Energy Use and Greenhouse Gas Emissions<br>Renewable Energy Use<br>Environment: Data |

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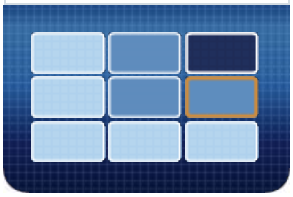

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## High Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Tailpipe Emissions

| | |
|---|---|
| Definition/Description | Air-quality impacts of vehicle emissions other than GHGs; trend toward greater regulation |
| Comments | High concern to customers/NGOs/stakeholders; more impact on Ford due to increased and inconsistent regulation |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Tailpipe Emissions<br>Environment: Progress<br>Sustainable Technologies and Alternative Fuels Plan<br>Environment Data: Tailpipe Emissions |

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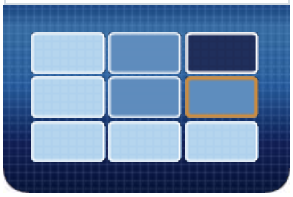

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## High Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Sustainable Materials

| | |
|---|---|
| Definition/Description | Cradle-to-cradle approach; use of renewable, recycled, recyclable materials |
| Comments | Formerly "materials use;" increased interest within Ford as a way to address life-cycle impacts |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Environment: Progress<br>Choosing More Sustainable Materials<br>Product Sustainability Index |

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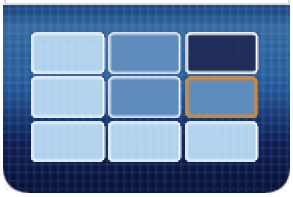

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## High Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Product Compliance

| | |
|---|---|
| Definition/Description | Monetary value of significant fines for non-compliance with laws and regulations concerning the provision and use of products and services |
| Comments | GRI item; of concern to Ford due to potential cost and impact on reputation |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Environment: Progress<br>Tailpipe Emissions<br>U.S. Safety Recalls<br>Compliance |

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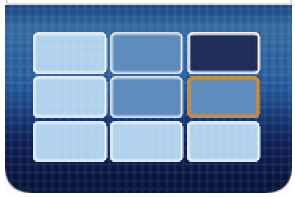

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## High Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Congestion

| | |
|---|---|
| Definition/Description | Key mega-trend with distinct manifestations in emerging and developed markets including infrastructure, public transportation; policy responses such as congestion pricing |
| Comments | Increasing importance to Ford as urban areas place restrictions on private vehicle use; driver of mobility strategy |
| Trend (from previous analysis) | Increased in importance to Ford |
| Level of control or influence | Low |
| More information | Mobility<br>Driving Environment |

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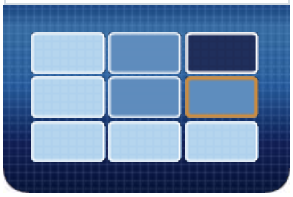

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## High Current or Potential Impact on Company

## Medium Concern to Stakeholders

## Health and Safety

| | |
|---|---|
| Definition/Description | Health and safety management systems; ergonomics |
| Comments | Emerging issue is managing H&S impacts of downsizing |
| Trend (from previous analysis) | Same position |
| Level of control or influence | High |
| More information | Workplace Health and Safety<br>Working Conditions in Ford Plants<br>Ford and the Automotive Industry Supply Chain<br>Workplace Safety |

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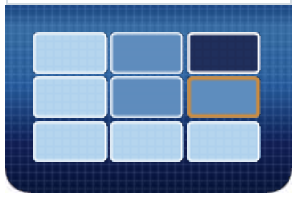

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# Climate Change



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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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John Viera

Director, Sustainable Business Strategies, Ford Motor Company

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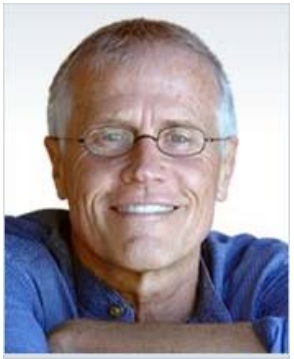

PERSPECTIVES ON SUSTAINABILITY

Paul Hawken

Environmentalist, entrepreneur, journalist, author

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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



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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



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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



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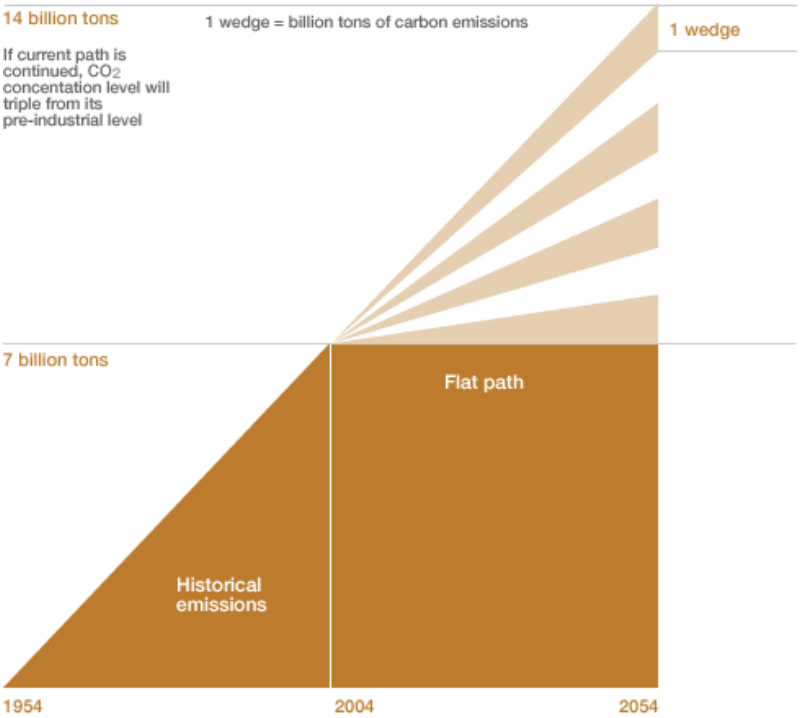
The assessment of the science of global warming issued in February 2007 by the Intergovernmental Panel on Climate Change concluded that, "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic [man-made] greenhouse 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.

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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

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

# Climate Change Risks and Opportunities



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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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- Delivering New Products
- Investor Ratings and Feedback
- U.S. Energy Security
- U.S. Greenhouse Gas and Fuel Economy Regulation

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



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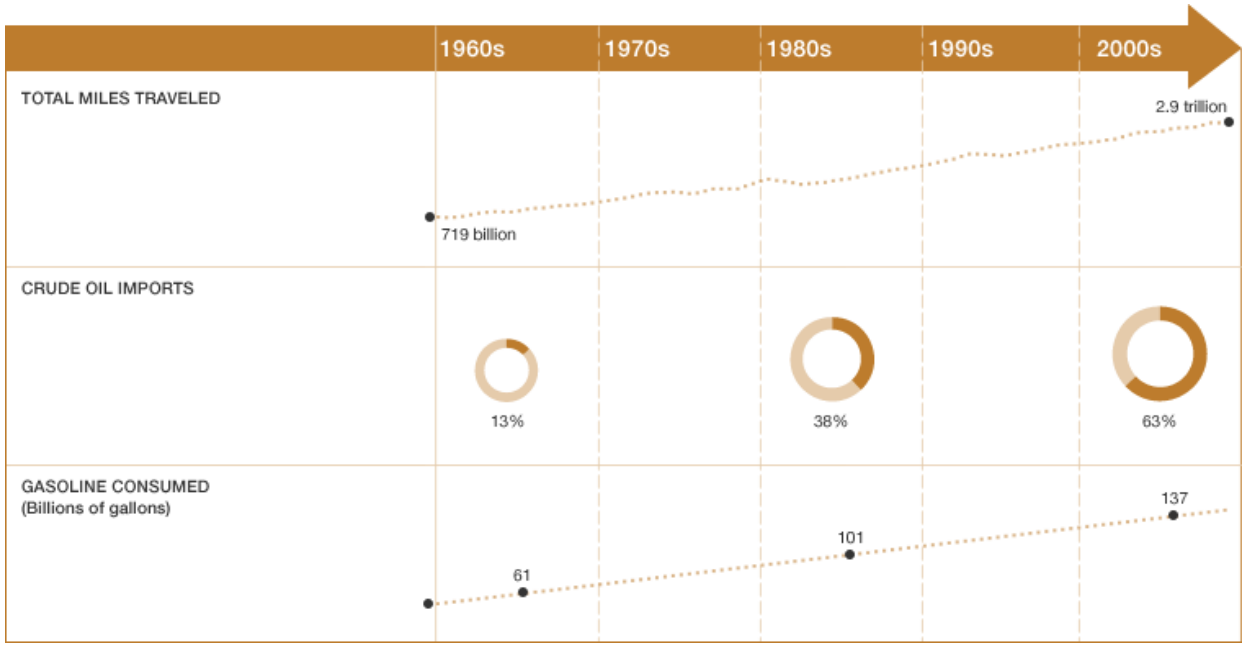
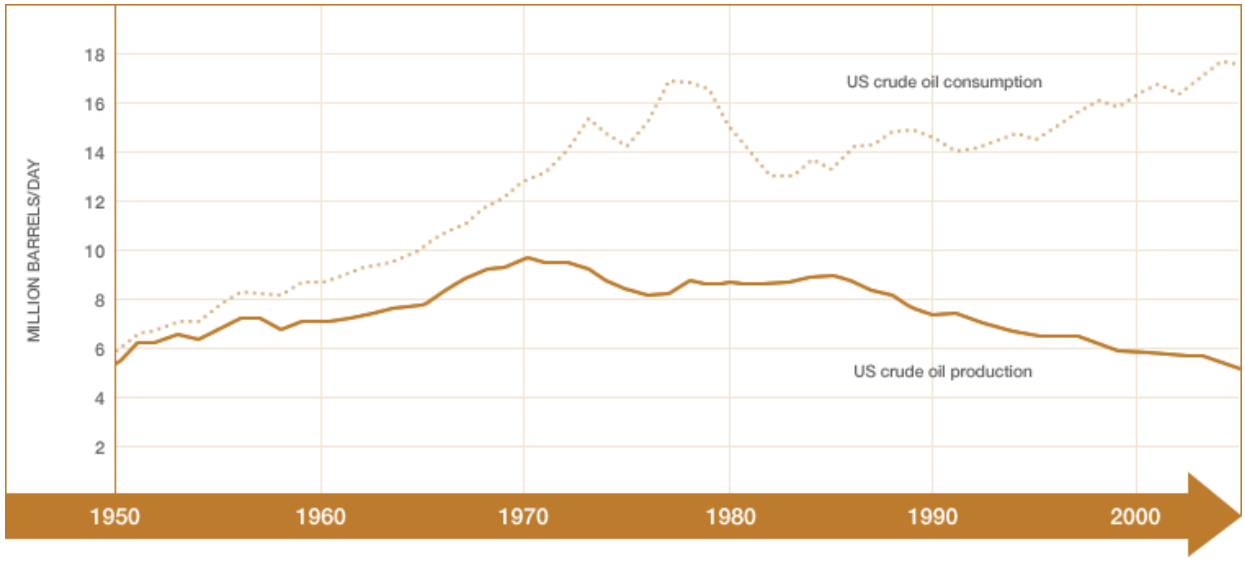
The following charts illustrate the primary issue underlying concerns about U.S. energy security – crude oil consumption is increasing, while domestic energy production is decreasing. Therefore, the United States is increasingly reliant on imported crude oil. The first chart shows the increase in the 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



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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
SUSTAINED EXCELLENCE

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

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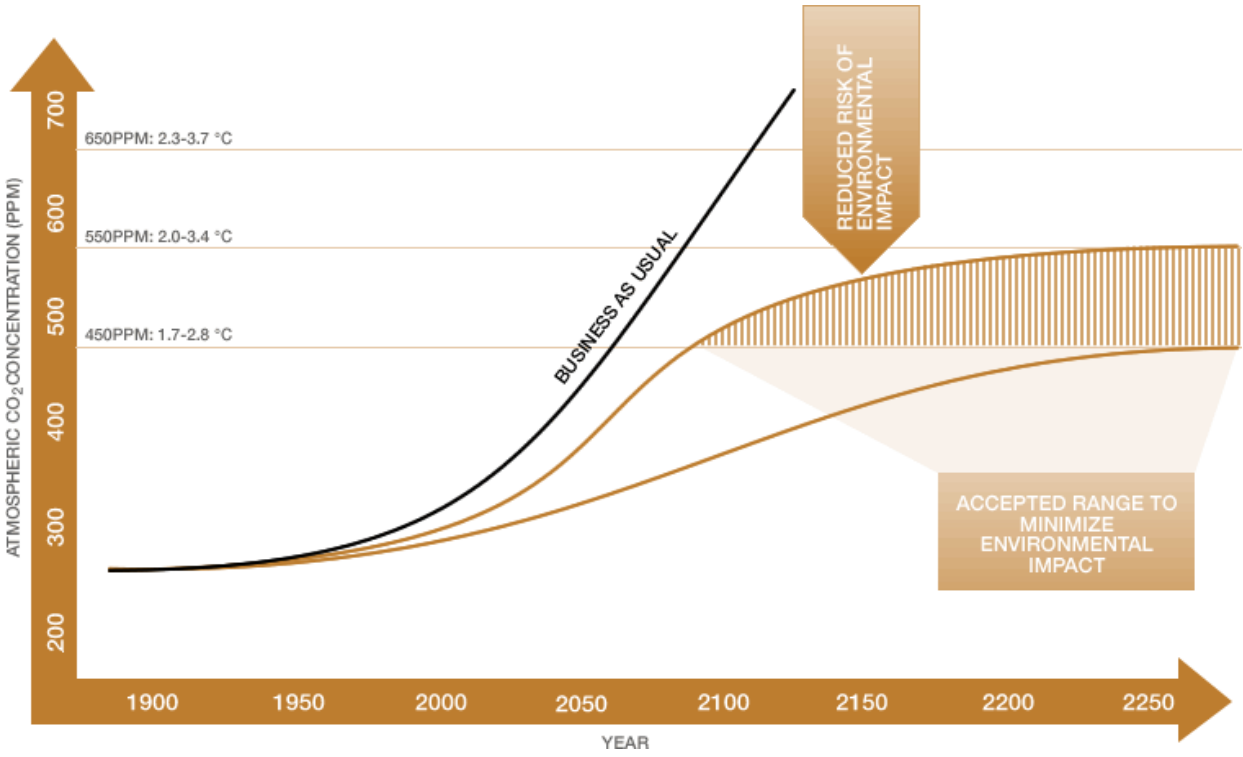
Sustainability Governance

External Web Sites:
Energy Star Award

## Stabilizing Atmospheric $CO_2$ Levels


ATMOSPHERIC $CO_2$ CONCENTRATION (PPM)
700
600
500
400
300
200
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



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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.

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# Sustainable Technologies and Alternative Fuels Plan



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.

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## 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.

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# Improving Fuel Economy



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| 2007 | 2011 | 2020 – 2030 |
|---|---|---|
| NEAR TERM<br>Begin migration to advanced technology | MID TERM<br>Full implementation of known technology | LONG TERM<br>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<br>▪ Introduction of battery management systems | ▪ Electric power steering full implementation | |
| ▪ Increased unibody applications<br>▪ Introduction of additional small vehicles | ▪ Weight reduction of 250–750 lbs<br>▪ 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.

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## 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 engines1.

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.

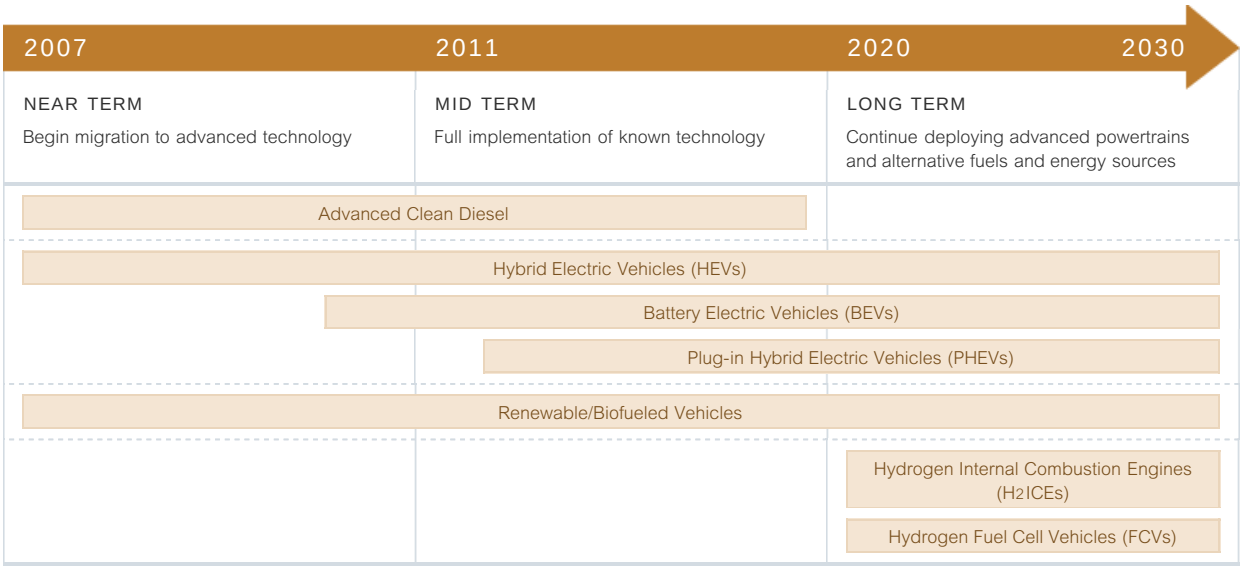
### Smaller Vehicles

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






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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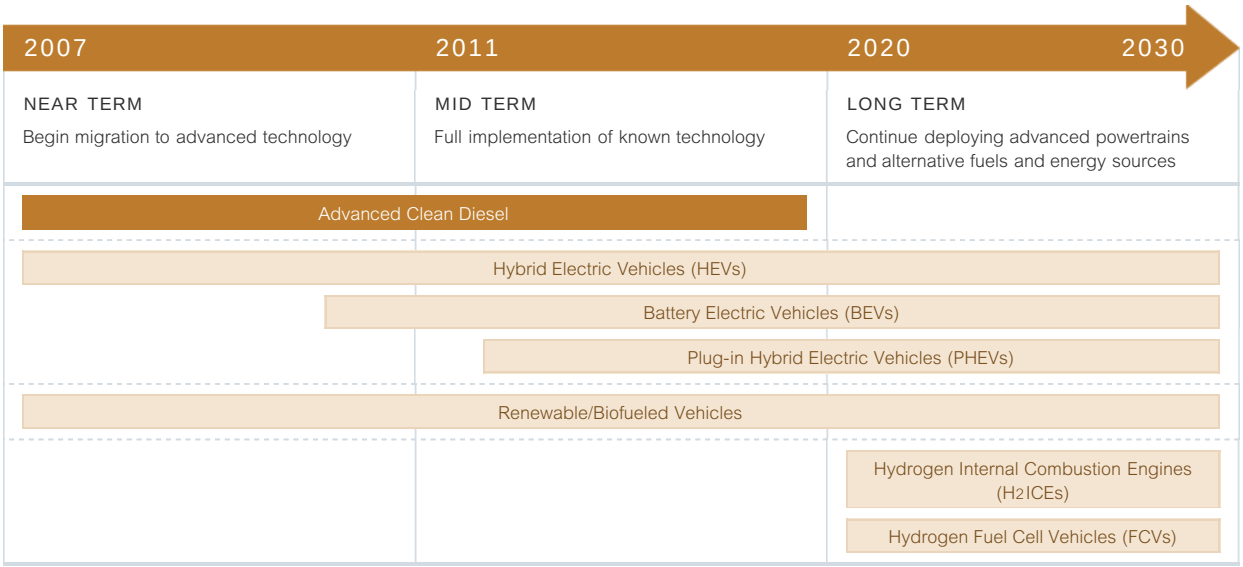


## Advanced Clean Diesel

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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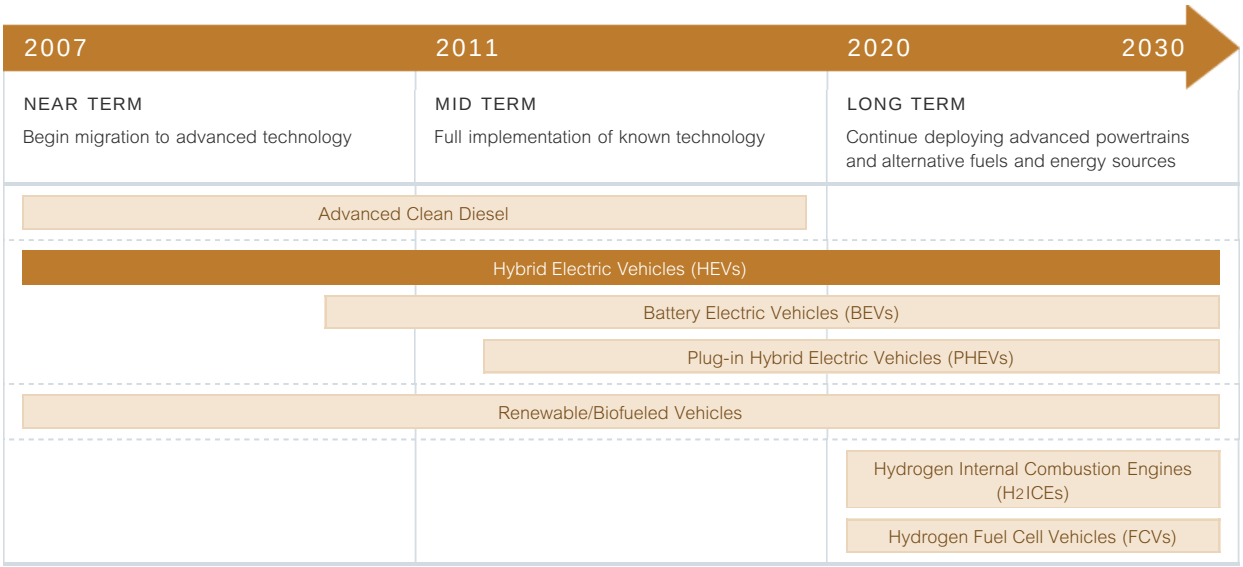


## Hybrid Electric Vehicles (HEVs)

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.

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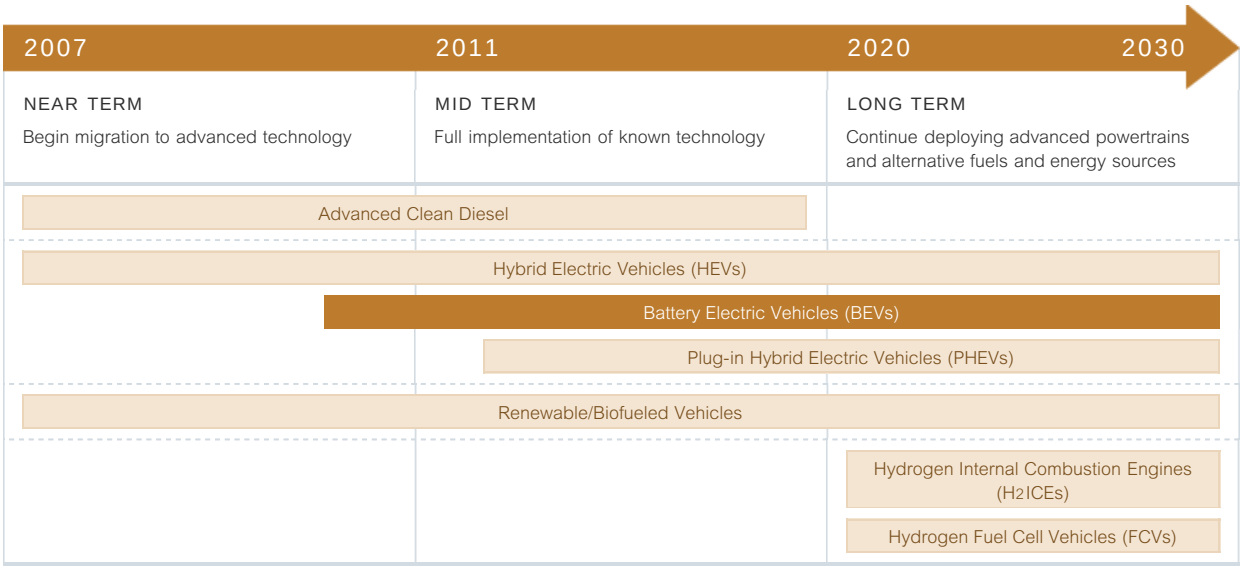


## Battery Electric Vehicles (BEVs)

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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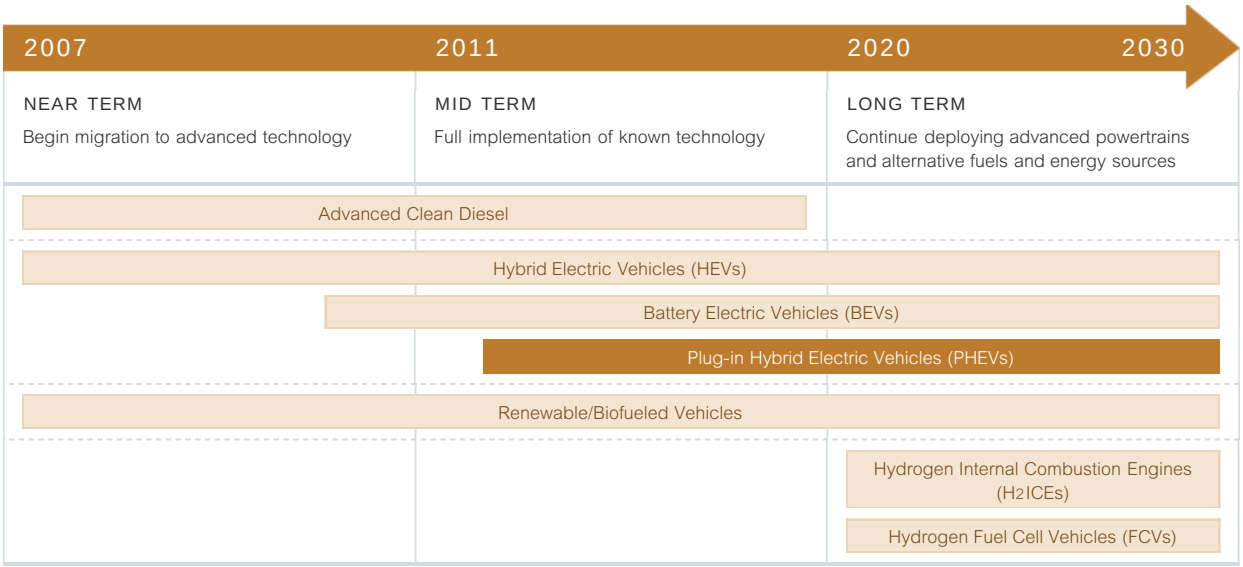


## Plug-in Hybrid Electric Vehicles (PHEVs)

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.

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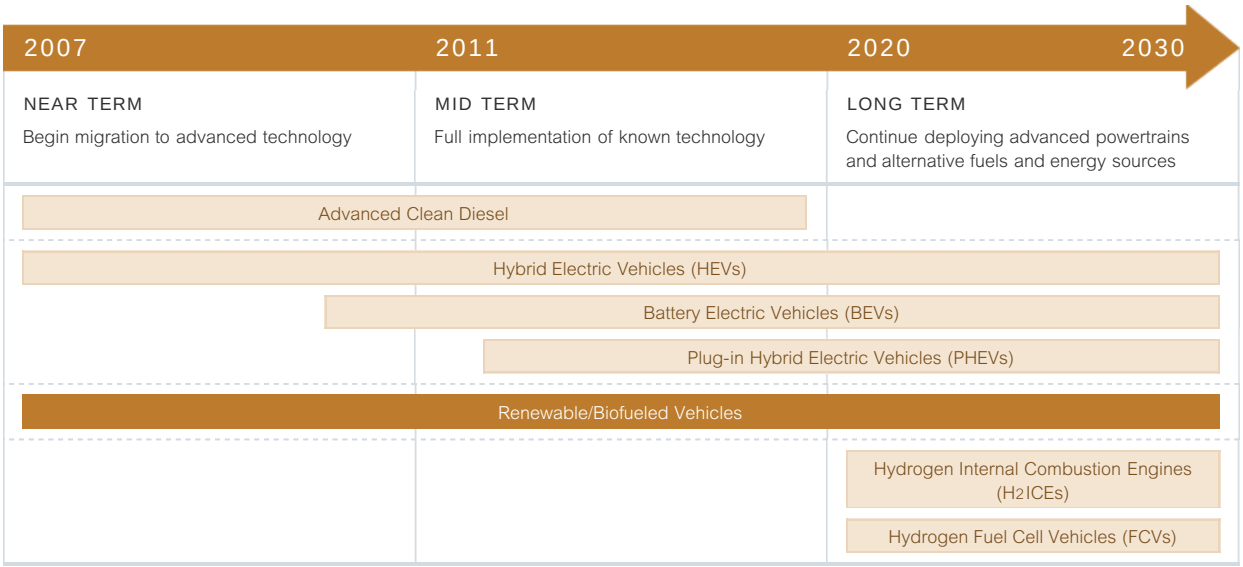


## Renewable/Biofueled Vehicles

### 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.

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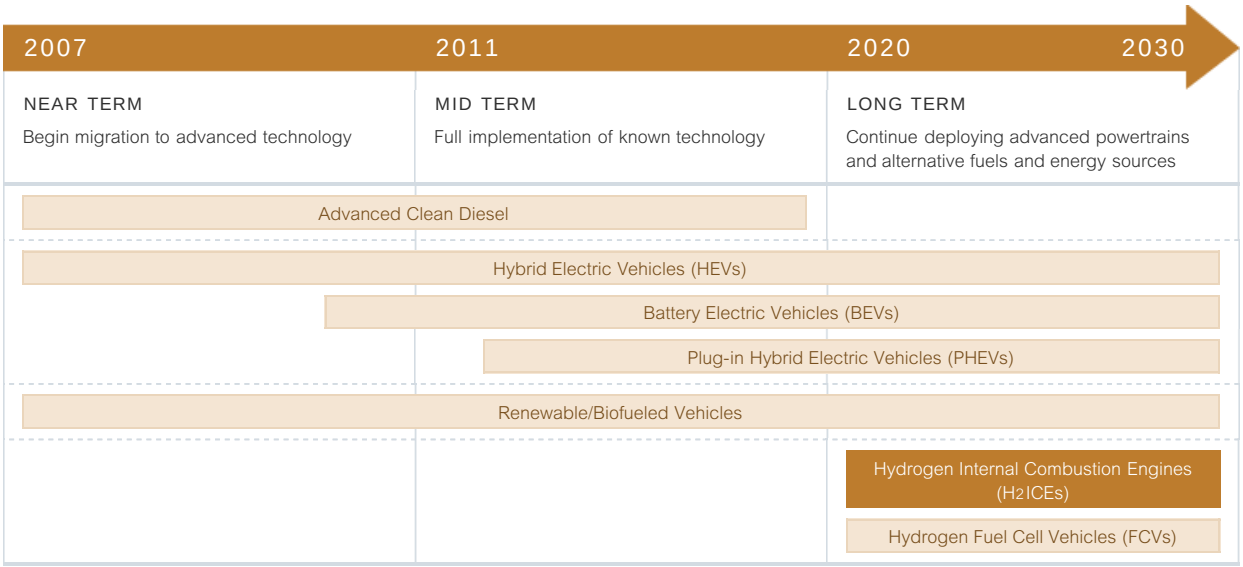


## Hydrogen Internal Combustion Engines ($H_2$ICEs)

Ford was the first automaker to develop commercially available hydrogen-powered internal-combustion engines ($H_2$ICEs), 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 $H_2$ICE 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 $H_2$ICE 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 $H_2$ICE fleet had successfully logged 200,000 miles in operation.

$H_2$ICEs still face considerable challenges. Like all hydrogen-powered vehicles, $H_2$ICEs are limited by fuel storage and fuel infrastructure issues and concerns about hydrogen safety. For example, current $H_2$ICE vehicles have a driving range of 150 to 200 miles, due to fuel storage limitations. $H_2$ICEs 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.

# Migration to Alternative Fuels



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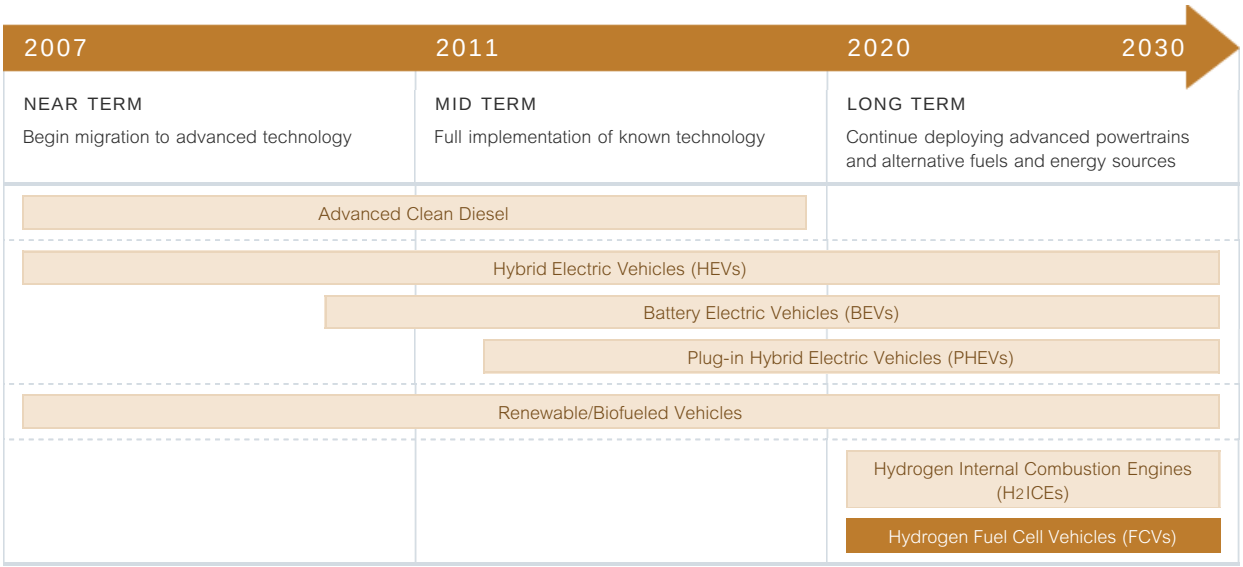


## Hydrogen Fuel Cell Vehicles (FCVs)

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.

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# 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

In This Report:
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

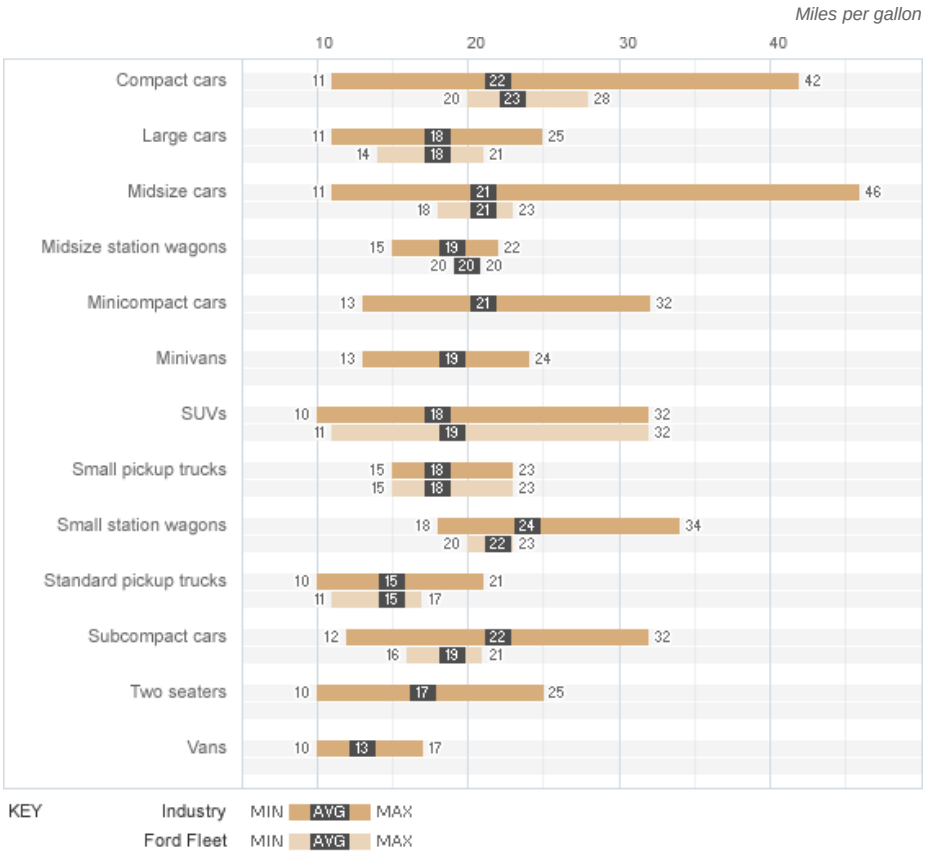
In Europe, we have reduced the average $CO_2$ emissions of the vehicles we sell by 18.9 to 22.9 percent depending on the brand, compared with a 1995 baseline. We have achieved these reductions by introducing a variety of innovations, including an advanced common-rail diesel engine, available on many 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

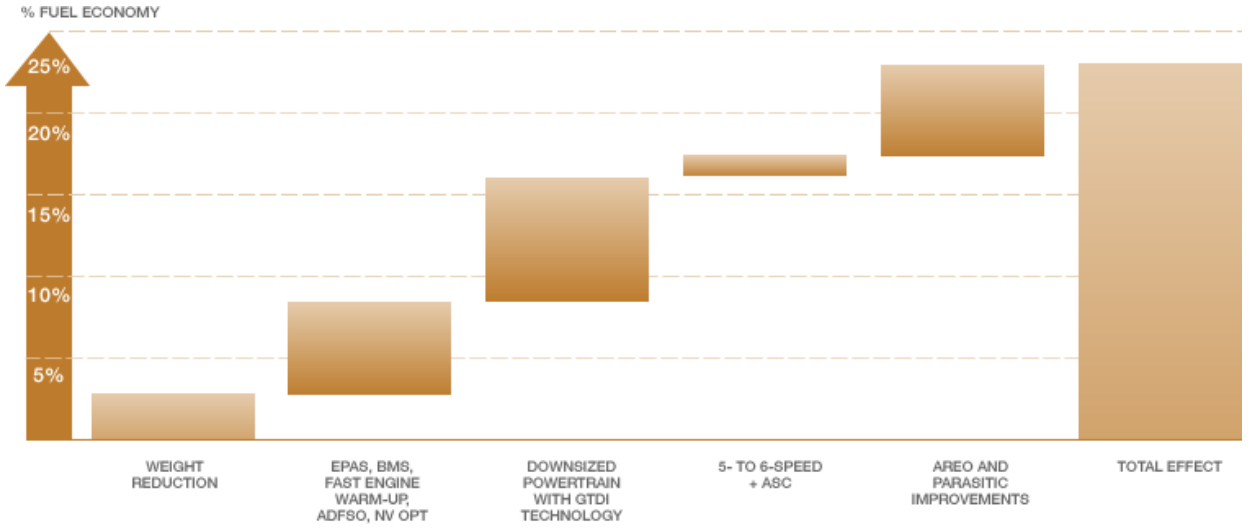
Chart | Table



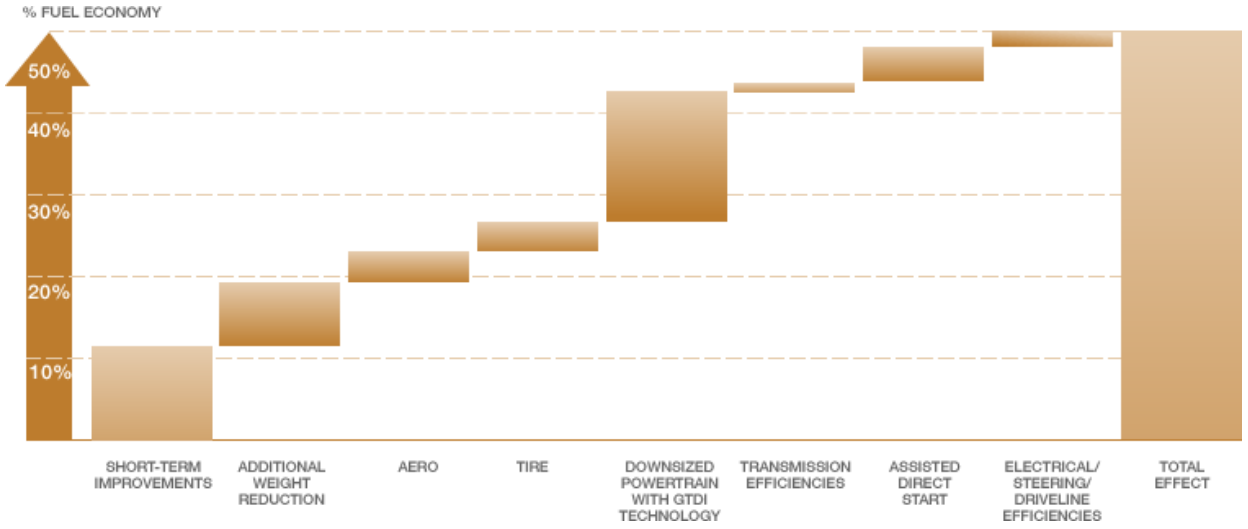

| | Industry | | | Ford | | |
|---|---|---|---|---|---|---|
| | Minimum | Average | Maximum | Minimum | Average | Maximum |
| Compact cars | 11 | 22 | 42 | 20 | 23 | 28 |
| Large cars | 11 | 18 | 25 | 14 | 18 | 21 |
| Midsize cars | 11 | 21 | 46 | 18 | 21 | 23 |
| Midsize station wagons | 15 | 19 | 22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



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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



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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



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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.

# U.S. Climate Change Legislation



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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



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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.

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

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

# 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.

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# Partnerships and Collaboration



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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"



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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?

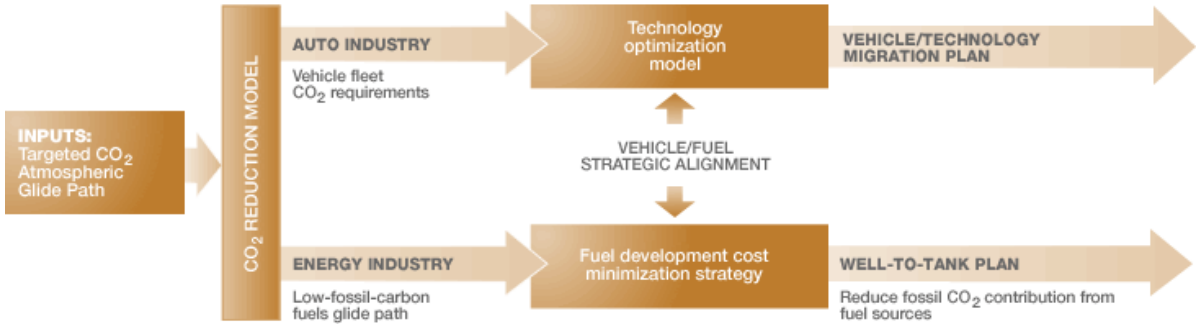
In the long run, the roles of consumers, governments and fuel availability will be pivotal in dictating actual $CO_2$ emission reductions, and Ford continues to take them into consideration in fine-tuning a truly viable and sustainable $CO_2$ stabilization pathway.

## 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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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.

RELATED LINKS

External Web Sites:

U.S. Climate Action Partnership

# 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<br>Future Grid: 60 g/km | Current Grid: ~115 g/km<br>Future Grid: ~71 g/km |
| Tank to Wheels | ~150 g/km | | ~100 g/km | Current Grid: ~26 g/km<br>Future Grid: 25 g/km | Current Grid: 0 g/km<br>Future Grid: 0 g/km |
| Well to Wheels [7] | ~185 g/km | | ~123 g/km | Current Grid: ~117 g/km<br>Future Grid: 85 g/km | Current Grid: ~115 g/km<br>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



## 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<br>■ Proven robustness | ■ About twice the energy content of Ni-MH and better suited to future plug-in electrified vehicle applications<br>■ 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<br>■ 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.

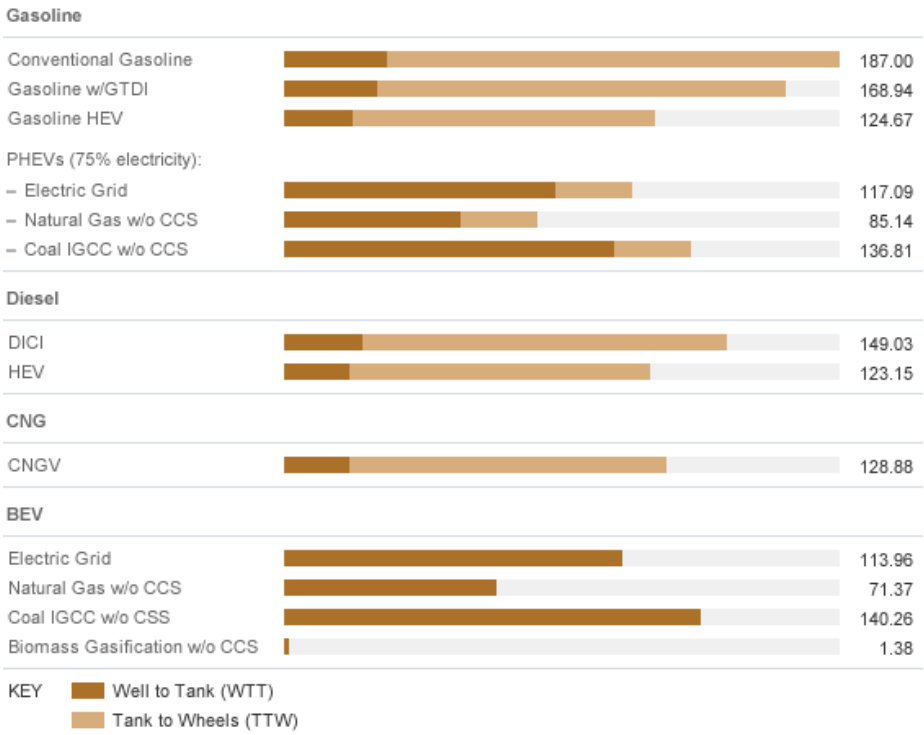
Thus, the promise of electrification is most fully realized when vehicles are powered by clean – ideally renewable – sources of electricity, which would reduce emissions substantially. To truly reap environmental benefits through the electrification of the transportation sector, the power-generation 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

*Grams per kilometer*




| | 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



## 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

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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.

# Mobility



Print report

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During 2008 we:

- Cosponsored a major forum on mobility
- Concluded pilot mobility projects in South Africa and India

Our goal is to make mobility affordable in every sense of the word – economically, environmentally and socially. Today, there are 6.7 billion people in the world. By 2050, there will be 9 billion people, 75 percent of whom will live in urban areas. Forty of the world's 50 largest cities will be in countries outside of North America, Europe or Japan. These mega-cities – urban areas of 5–10 million people or more – will be increasingly affluent and increasingly crowded (see "Mega-Cities: The Icon of Personal Mobility Challenges").

Residents of these cities will want – and deserve – the same freedom of mobility that many in developed nations enjoy today. But, because of energy costs, climate change concerns, infrastructure constraints and resource limits, business as usual will not work.

Many cities are already imposing regulations to restrict the use of private transportation. For example, London, Vienna and Bucharest have established anti-congestion policies in the form of a tax on personal vehicle usage into the city. Legislation is pending in Berlin, Paris and Tokyo to enforce zero emission public transportation. Adding more and more privately owned cars to a mega-city may not be possible, and certainly isn't practical. A car stuck in traffic wastes time and energy, a car sitting in a parking garage all day while its owner works wastes a valuable asset.

We need to explore sustainable alternatives. We believe that creative collaboration and innovative technologies and services can yield new solutions, and that these solutions can harness the benefits of mobility while reducing its environmental and social impacts. Information technology shows promise for overcoming barriers to integrated urban mobility systems that rely on multiple modes of transportation seamlessly tied together. Ford has been a leader in exploring the potential for these models to contribute to solutions, especially in urban areas (see "What Is New Mobility?").

During 2008, we intensified our focus on the challenges of urban areas in both developed and developing countries. Ford cosponsored a major forum on mobility at the University of Michigan that brought together leading thinkers from around the world to share knowledge and insights, and plan collaborative projects. We concluded our involvement in pilot mobility projects in Cape Town, South Africa, and Bangalore and Chennai, India, gaining important insights that will aid us in the future. And we refocused our mobility efforts on products like electric vehicles, bringing together fleet managers, utilities and city leaders to encourage use of these technologies in alignment with the priorities of the new U.S. administration.

This section describes the actions Ford is taking to deepen our understanding of the future of mobility and to develop and test sustainable mobility solutions for all of our global customers.

PERSPECTIVES ON SUSTAINABILITY

**Bert Bras**
Professor of Mechanical Engineering

**Tina Guldberg**
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# Mobility Challenges and Opportunities



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Mobility is a basic human need. Developed and emerging economies alike require transportation systems to get goods to market and people to the places where they work, shop, dine, gather and have fun.

Automobiles have provided personal mobility for more than 100 years. There are currently 900 million vehicles in the world, and that number is increasing rapidly as individuals in developing markets reach new levels of prosperity; it could reach 2 billion by the middle of this century.

This sounds like good news for an automotive company, and to some extent, it is. Our most rapid sales growth is taking place in emerging markets. But a business model built on private ownership of automobiles comes with inherent challenges, which are related directly to the following current and emerging mega-trends:

## Urbanization

By 2015, it is projected that at least 35 mega-cities will have a population of more than 10 million. The migration of rural populations to urban areas often outpaces infrastructure development, leading to overcrowded, substandard living conditions and inconvenient, congested transportation systems.

## Congestion

Each year, traffic congestion is estimated to cost the United States $67.6 billion, and the average metropolitan driver endures 27 hours of traffic delays. In many places, especially developing countries, traffic delays are considerably worse, and are increasing at an alarming pace. As more vehicles crowd limited road networks, congestion increases. This, in turn, creates pollution, reduces fuel efficiency and wastes travelers' time.

## Climate Change

The transportation of people and goods accounts for about a third of global human-caused greenhouse gas emissions. Stabilizing greenhouse gas emissions in the atmosphere will require a concerted effort on the part of the private and public sectors to achieve significant cuts in transport-related emissions, at a time when rapid growth in the transportation sector is anticipated.

## Shifting Demographics

Different regions of the world are experiencing opposing population trends. Among the more developed countries, only the U.S. is growing in population; Europe, Russia and Japan are all shrinking. Regions of Africa and Asia are growing in population and will have large numbers of young people. But by the middle of this century, most of the world will be much older on average. With most people living in urban areas, more and different forms of mobility will be needed to support independent living for seniors, the disabled and young people.

## Social Inequality

The growing gap between rich and poor creates enormous needs for innovative, affordable mobility solutions that meet human needs and help people build a better way of life. Unequal access to transportation often limits the opportunities available to those most in need. Better mobility is part of the solution to unemployment and income disparities.

Taken together, these trends point to increasingly diverse and fragmented markets for traditional automobile sales. They also point to significant opportunities for companies that are able to respond to mobility needs creatively.

# Ford's Approach to Urban Mobility: Catalyst for Learning, Collaboration and Action



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As mobility models change, so do the needs of our customers and potential customers. For several years, Ford has worked with a wide range of academic and public and private sector partners to explore sustainable mobility issues, advance thinking and catalyze on-the-ground projects to test different approaches to urban mobility. The insights we gain from this work help us to understand the forces that are shaping our markets, our role in addressing mobility challenges and the opportunities these trends present for us.

## Pilot Urban Mobility Projects

During 2008, we worked on pilot projects including the following:

- Cape Town, South Africa is the capital of the Western Cape Province. It is a popular tourist destination and will be a host of the World Cup in 2010. To prepare for the tournament, local officials are seeking to upgrade the city's transportation systems, from its aging taxi fleet to its bus and rail systems. The city also wants to build on the legacy created by the World Cup to provide solutions to persistent problems of congestion and access to mobility for the poor, and develop a whole new industry around business opportunities in connecting the transportation dots. The project has an economic, systems and accessibility approach by focusing on how people meet their needs, rather than how to move people from point A to point B.

  Ford and the University of Michigan's Sustainable Mobility and Accessibility Research and Transformation (SMART) program have been working since early 2007 to engage private-sector leaders, local thought leaders and government and transportation officials, as well as taxi, minibus and bike entrepreneurs, in planning for a new mobility project. Planning is under way for a network of mobility hubs. A hub is a transfer point where multiple mobility options and services come together. In turn, one hub connects with an integrated system of hubs to provide seamless, convenient, sustainable, safe and affordable door-to-door trips for everyone – rich and poor.

  In Cape Town, the hubs will link multiple mobility services, including buses and metro trains, minibuses, taxis, car-share vehicles and bike-share vehicles. They will also include restaurants and shops. Travellers will eventually be able to use a software device, connected through a cell phone or information kiosk, to access integrated, multi-modal, real-time travel information. A leading NGO, IDASA, is coordinating meetings of larger forums and smaller working groups and facilitating deeper democratic engagement around the project.

- In Chennai, India, inadequate infrastructure and congestion are creating air quality and safety problems in the urban center. Ford has helped catalyze a pilot project to provide mobility hubs and feeder services along the IT business corridor for bus and light rail customers. This pilot will help integrate various modes of transportation and greatly improve travellers' opportunities to transfer seamlessly from one mode to another, especially from MRTS and other vehicles to buses that ply the corridor. Working together in an integrated manner, these services will become a model system that can be replicated across the city, promoting the use of public transportation and helping create a world-class public transport system for Chennai.

- In Atlanta, Georgia, Ford has worked with the Sustainable Design and Manufacturing Program at Georgia Tech to develop and test mobility solutions for one of the United States' most mobility-challenged cities. These efforts have included identifying technical options for improved urban mobility in Atlanta area; assessing their potential impact in terms of financial, environmental and social benefits and costs; and creating an engineering design framework to invent and test solutions.

One pilot project placed a solar-powered information kiosk on the Georgia Tech campus. Travellers could use the kiosk to plan a route to their destination using various transportation options. The kiosk provided information about route alternatives, schedules, costs and real-time tracking of buses, shuttles and other conveyances. Researchers gathered feedback from users to refine the system. They also tested a similar, cell-phone-based information technology application.

The insights from these pilot projects are contributing to a better understanding of sustainable mobility challenges and solutions. The researchers are viewing urban mobility as a complex system and are

looking at how best to integrate:

- Vehicles
- Powertrain Technologies
- Fuels
- Fleets
- Information Technology
- Systems Design
- Revenue and Marketing
- Sustainability Attributes

## Collaboration to Support Electrification

Through work on these pilot projects, we have gained insight into the mobility needs of urban residents, the institutions that must work together to forge solutions and the range of technical solutions and their strengths and weaknesses. These insights come together in our urban mobility methodology that can be applied to a variety of settings and challenges. This equips us as a company to respond to rapidly changing needs for mobility by offering new products and services.

For example, we are using what we've learned in diverse global locations to support the effort to build markets for electric vehicles in the United States. These vehicles will play an important role in reducing $CO_2$ emissions from the transportation sector. They can be deployed in various ways as part of urban mobility solutions. But, like the creation of integrated mobility systems, the manufacturing, distribution and sales of electric vehicles will require new business models. Multiple technologies and industries will need to converge to marry vehicles and infrastructure, utility services and information technology. Transportation and utilities will become interdependent. City leaders will need to take a system-wide approach to develop clean, green, "cool" and sustainable cities.

Several Ford functions – including the sustainable business strategies group, fleet sales and sustainable mobility technologies – are working together with a range of partners to deploy fleets of electric vehicles over the next two to five years.

With rising concern over carbon emissions from private vehicles and renewed emphasis on green transportation and infrastructure, urban leaders are looking for creative solutions to enhance transit use and reduce car use by linking bicycles, electric bikes and scooters, car sharing, car rental and ridesharing. With help from economic stimulus funds, they are poised to increase investment in electric and plug-in hybrid-electric vehicles including cars, trucks, conventional buses, trolley buses, express buses, and all forms of rail including streetcars, light rail and heavy rail.

We are working in several cities to put together coalitions of city and state agencies, utilities, transportation providers and others to pursue stimulus funding for electric vehicle fleets. This will help build the critical mass of electric vehicle sales that will be needed to help overcome a range of challenges to widespread electric vehicle use including infrastructure, affordability, battery technology and public policy (see "Electrification: A Closer Look" for more discussion of challenges and solutions).

## Continuing Learning and Engagement

We are also continuing urban mobility research in the Brazil, Africa and India. In addition, we have learned from our involvement in the Center for Sustainable Transport Turkey (SUM-Türkiye), has the goal of delivering sustainable transport solutions to Turkish cities. Its efforts have centered on improving air quality and reducing travel times by promoting mass transit. SUM Turkey has completed Istanbul's first emissions inventory and has provided technical advice to the city on its new Bus Rapid Transit system, Metrobus, which has now added an additional line. More information is available at the EMBARQ Istanbul Web site.

# Partnerships and Collaboration



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Mobility issues are complex and rapidly changing. Developing solutions to mobility challenges requires innovative, systems thinking. That's why we've developed sustained relationships with organizations including the following that give us access to the latest research, insights and integrative ability.

## Sustainable Mobility and Accessibility Research and Transformation (SMART)

Ford has been working with the University of Michigan on the SMART project since April 2005. SMART takes a collaborative, systems approach to developing innovative, sustainable and connected mobility and accessibility solutions in urban regions around the globe. Building on the seminal work of Moving the Economy in Toronto, SMART has pioneered new thinking, new partnerships and pilot projects related to emerging New Mobility markets and industry development.

SMART has provided the empirical research and inspiration for Ford's mega-city mobility projects. The insights of the SMART leadership team have served as a foundation for our innovative approach to business opportunities related to New Mobility and for our work with other key sectors, including manufacturing, IT, logistics, tourism, real estate, design and more. In addition to developing New Mobility business opportunities and markets, SMART and Ford are seeking to improve quality of life, employment and other community benefits in cities all over the world over the long term. We are convinced that our partnership with SMART will produce a new systems approach for addressing the increasingly complex challenges to achieving sustainable mobility and accessibility globally, while at the same time transforming the transportation industry into a more sustainable and equitable New Mobility industry.

## Georgia Tech Joint Research Projects

Ford and Georgia Tech have a strong cooperative relationship, focused particularly on sustainability. Our present joint research projects are funded under a multi-year agreement to partner in design, manufacturing and logistics, and in mega-city mobility research. Our collaborative approach has been effective in developing talent among students, faculty and Ford professionals, as knowledge is transferred between the university and company settings. For instance, the students develop enthusiasm for the contributions of engineering in the realms of manufacturing and sustainability, and they gain valuable work experience during summer internships. At present, Georgia Tech is assisting Ford by:

- Developing the business case for mega-city mobility, especially pertaining to finance, information technology and vehicles (including fuels, design, carbon and powertrains)
- Building on the results of Ford's prototype projects, particularly with regard to software device connections

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Georgia Tech

# Mega-Cities: The Icon of Personal Mobility Challenges



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Mega-cities are urban areas with more than 10 million residents. At least 25 mega-cities already exist worldwide. Twenty are located in the developing world, as are seven of the nine most populous. By 2015, there are projected to be at least 35 mega-cities, with virtually all the growth in developing countries. Mega-cities experience a wide range of social and environmental problems, many of them related to mobility.

All of the mega-trends we have identified, as well as other challenges to sustainable mobility, are at their worst in mega-cities, and engender paralyzing traffic congestion, air pollution, vehicle-related injuries and fatalities, and health problems. Furthermore, social inequality and the dislocation of families and communities are increasing as people move from rural areas to mega-cities seeking economic opportunities. To develop mega-city mobility strategies will require addressing the mobility needs of rural as well as urban residents, as many mega-city problems could be improved by developing new approaches to the transportation of people and goods between rural and urban areas, and by reducing the need for rural–urban migration.

Mega-cities face a wide range of mobility challenges, including paralyzing traffic congestion, air pollution, vehicle-related injuries and fatalities, and health problems.

# What Is New Mobility?



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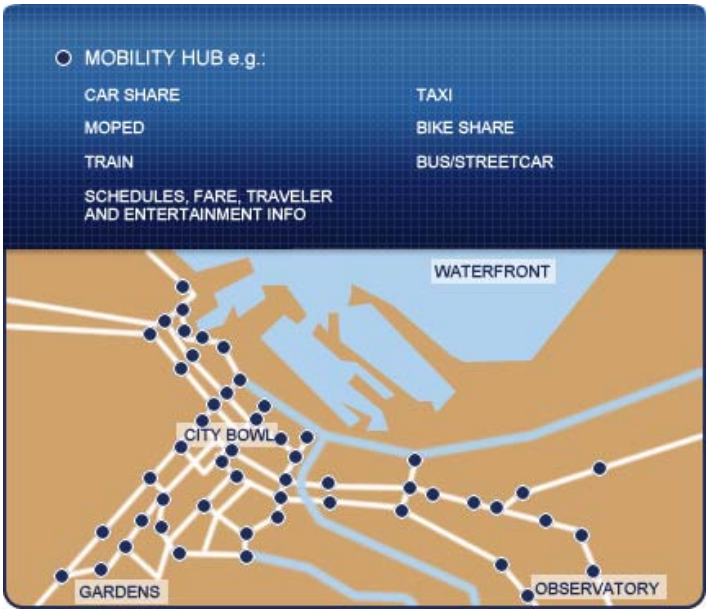
As we reach the limits of conventional models of mobility, "new mobility" offers a practical route forward. New mobility approaches transportation needs and options from a systems perspective. It relies on collaborative partnerships and information technology to bring existing services, products, technologies, infrastructure and design together into something that is greater than the sum of its parts – smarter, more sustainable, more convenient, more equitable and better connected.

Examples of new mobility systems already exist, notably Hong Kong's "Octopus" system, which uses a "smart card" to provide travelers with access to multiple transit services as well as ferries, parking and retail outlets. Other examples exist in Bremen, Germany; Bogotá, Colombia; Paris, France; Curitiba, Brazil; Portland, Oregon; and more. Key features of new mobility systems include the innovative use of technology to link diverse transportation systems such as rail, bus and subway with car sharing, bike sharing and other options, to provide flexible, seamless, door-to-door trips. Technologies can also enable distance working, learning, medicine and shopping, thereby reducing the need for some trips altogether. And still other information technologies support the sustainable and efficient movement of goods in urban regions, a growing area of concern and opportunity for innovation.

New mobility also depends on something more old-fashioned: collaboration and partnership. Technology can "connect the dots," but only humans can get the varied institutions and interests involved in urban mobility to work toward a common end. Thus, new mobility projects like those described in this section require extensive stakeholder engagement and establishment of trust between the many partners with a role to play.




## MOBILITY OPTIONS

"Connecting the dots" for urban commuters through the use of information technology, scheduling, navigation, congestion identification and avoidance, and fare payment would be available on PDAs or cell phones.

## BENEFITS

High quality, safe, clean transportation widely accessible in crowded urban areas reduce congestion, fuel consumption, pollution and carbon emissions.

# Human Rights



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During 2008 we:

- Trained suppliers in China, Mexico and South Africa
- Joined the United Nations Global Compact

Ford Motor Company has long recognized that treating people with dignity and respect is fundamental to how we conduct business around the world. In 2000, we made human rights a core element of our sustainability strategy, and in 2003, we began implementing the Ford Code of Basic Working Conditions (CWBC) throughout our global operations and $90 billion supply chain. Ford requires suppliers to ensure that products – no matter where they are made – are manufactured under conditions that demonstrate respect for the people who make them. This is just as important to us as quality, cost competitiveness and timeliness of delivery.

In order to effectively engage suppliers throughout the chain on issues relating to human rights and working conditions, Ford takes a three-pronged approach:

- **Engagement with Individual Supplier Facilities:** Training and capability building form the basis of Ford's supply chain working conditions program, supported by assessments of individual factories. Through these programs, we have trained 1,621 managers at 1,317 supplier companies and assessed more than 550 suppliers.
- **Engagement with Key Suppliers' Corporate Management:** Ford is working with its strategic production suppliers at the corporate level to enhance their policies, verification systems and ability to influence their own supply chains.
- **Collaboration within the Automotive Industry:** Ford is driving collaboration between automakers and supply chain companies on global working conditions issues through the Automotive Industry Action Group (AIAG).

During 2008, we expanded our work in each of these areas, with a goal to leverage our complex global supply chain to make a positive impact in the markets in which we do business.

In early 2008, Ford joined the United Nations Global Compact (UNGC), a framework for businesses that are committed to aligning their operations and strategies with 10 universally accepted principles in the areas of human rights, labor, the environment and anti-corruption. This action reinforces our commitment to outstanding performance and transparency in these areas.

Ford was asked to join the UNGC's Human Rights Working Group as a representative of global industry; we are the only automotive company participating on that panel. The Working Group's objectives include outreach to other businesses and society and collective advocacy around the 60th anniversary of the Universal Declaration of Human Rights. The Working Group also aims to improve dialogue with governments; build capacity on business and human rights generally and on particular human rights issues; foster collaboration with partners, including nongovernmental organizations; and work with business and human rights thought leaders to share methods and approaches.

**Human rights** refers to basic standards of treatment to which all people are entitled. It is a broad concept, with economic, social, cultural, political and civil dimensions. For Ford, this means ensuring that our products, no matter where they are made, are manufactured under conditions that demonstrate respect for the people who make them. It also means respecting the rights of people living in the communities around our facilities, and those of our suppliers, who may be affected by these operations.

**Working conditions** refers to aspects of human rights in the workplace, as governed by local laws and affected by international standards pertaining to workplace issues such as child labor, harassment and discrimination, health and safety, wages and benefits, freedom of association,

PERSPECTIVES ON SUSTAINABILITY

Mark Mittelhauser

Acting Director, Office of International Labor Affairs and Corporate Social Responsibility, Bureau of Democracy, Human Rights and Labor, U.S. Department of State

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External Web Sites:

United Nations Global Compact

The Labour Principles of the United Nations Global Compact: A Guide for Business

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UN Global Compact Letter from Alan Mulally (pdf, 126kb)

working hours and forced labor.

## The 10 Principles of the UN Global Compact

### Human Rights

- **Principle 1**: Businesses should support and respect the protection of internationally proclaimed human rights; and
- **Principle 2**: make sure that they are not complicit in human rights abuses.

### Labor Standards

- **Principle 3**: Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining;
- **Principle 4**: the elimination of all forms of forced and compulsory labor;
- **Principle 5**: the effective abolition of child labor; and
- **Principle 6**: the elimination of discrimination in respect of employment and occupation.

### Environment

- **Principle 7**: Businesses should support a precautionary approach to environmental challenges;
- **Principle 8**: undertake initiatives to promote greater environmental responsibility; and
- **Principle 9**: encourage the development and diffusion of environmentally friendly technologies.

### Anti-Corruption

- **Principle 10**: Businesses should work against corruption in all its forms, including extortion and bribery.

# Ford's Commitment to Human Rights



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Ford has been a leader in addressing human rights and working conditions in the auto industry. We are committed to respecting human rights everywhere we operate, because it's the right thing to do and it strengthens our business in the long run.

We believe people are most likely to excel in an environment that aims for excellence. A safe workplace in which people are treated with respect promotes increased quality, productivity, employee retention and morale. It can also decrease quality problems and health care costs. This is true in our own facilities and in those of our suppliers. Indeed, we believe a supplier company's efforts to address working conditions, environmental challenges and other sustainability issues are good indicators of its management's leadership capabilities.

Like other automakers, we are expanding our presence in emerging markets, where most of the growth in automobile sales is expected to occur. Respect for human rights is essential to maintaining the trust and respect of residents in the communities around our facilities and other stakeholders, including customers. That trust is critical to our ability to operate and sell our products in an intensely competitive global marketplace.

The legal structures governing working conditions, and the level of enforcement, vary widely across the countries in which we operate. Ensuring sound working conditions in the supply chain is ultimately suppliers' responsibility, and we would like governments to play the lead role in enforcing compliance with laws. While many of our suppliers routinely provide outstanding working conditions, we recognize the need to help suppliers build capability and assess compliance in order to have confidence that they meet our standards.

Ford's commitment to human rights is embodied in our Code of Basic Working Conditions, which forms the foundation of our work in our own operations and supply chain and our collaboration with others in the industry. The CBWC articulates our commitments on key human and labor rights issues. In effect since 2003, it was formally adopted as a Policy Letter in 2007. The CBWC is based on fundamental elements of internationally recognized labor standards, including the Universal Declaration of Human Rights, International Labour Organization Covenants, the Organisation for Economic Co-operation and Development's Guidelines for Multinational Enterprises, the United Nations' Global Compact Principles, the Global Sullivan Principles, and standards of the Fair Labor Association and International Metalworkers' Federation. Ford encourages businesses throughout our supply chain to adopt and enforce similar policies, and seeks to identify and do business with organizations that conduct their businesses to standards that are consistent with the CBWC.

The CBWC covers workplace issues such as working hours, child labor and forced labor. It also reflects our increasingly integrated approach to managing human rights and community issues by articulating our commitments on several key issues that extend beyond the fencelines of our facilities, including community engagement and indigenous populations, bribery and corruption, and environment and sustainability.

We encourage employees who have a good-faith belief that there may have been a violation of this Code to report it through established channels, which vary by region, or to the Office of the General Counsel.

These reports are then forwarded to the Manager of Human Rights, who takes action to clarify, validate and correct the situation, if necessary. No retaliatory actions are taken against employees who report concerns about violations of the CBWC.

We enforce our commitment to human rights through our Code of Basic Working Conditions.

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Community

# Code of Basic Working Conditions



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This Code of Basic Working Conditions represents the commitment of Ford and its worldwide subsidiaries. The diverse group of men and women who work for Ford are our most important resource. In recognition of their contributions, we have developed policies and programs designed to ensure that our employees enjoy the protection afforded by the principles articulated today in this Code. While these principles are not new to Ford, they are vitally important to what we stand for as a company. Consequently, we have chosen to summarize them here in an expression of our global commitment.

While this Code of Conduct serves to detail, specifically, our standards for labor and environmental standards throughout our global operations, it also stands as a general endorsement of the following human rights frameworks and charters:

- The UN Universal Declaration of Human Rights
- The ILO Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy
- OECD Guidelines for Multinational Enterprises
- The Global Sullivan Principles of Social Responsibility

The diverse universe in which Ford operates requires that a Code such as this be general in nature. In certain situations, local legal requirements, collective bargaining agreements and agreements freely entered into by employees may supersede portions of this Code. Nevertheless, we believe this Code affirms important, universal values that serve as the cornerstone of our relationship with employees.

## Child Labor

We will not use child labor. In no event will we employ any person below the age of 15, unless this is part of a government-authorized job training or apprenticeship program that would be clearly beneficial to the persons participating.

## Compensation

We will promote our employees' material well-being by providing compensation and benefits that are competitive and comply with applicable law.

## Forced Labor

We will not use forced labor, regardless of its form. We will not tolerate physically abusive disciplinary practices.

## Freedom of Association and Collective Bargaining

We recognize and respect our employees' right to associate freely and bargain collectively. We will work constructively with recognized representatives to promote the interests of our employees. In locations where employees are not represented by unions, we will seek to provide opportunities for employee concerns to be heard.

## Harassment and Discrimination

We will not tolerate harassment or discrimination on the basis of sex, race, color, creed, religion, age, ethnic or national origin, marital/parental status, pregnancy, disability, sexual orientation or veteran status.

## Health and Safety

We will provide and maintain for all employees a safe and healthy working environment that meets or exceeds applicable standards for occupational safety and health.

## Work Hours

We will comply with applicable law regulating hours of work.

## Community Engagement & Indigenous Populations

We shall consider indigenous peoples among our primary stakeholders in all projects we consider undertaking. We will openly and honestly engage all recognized members of our stakeholder community who have an interest in our activities.

## Bribery and Corruption

We will under no circumstances tolerate the giving or receiving of undue reward to influence the behavior of another individual, organization, politician or government body, so as to acquire a commercial advantage; this extends to all of our regional operations, regardless of whether bribery is officially tolerated and condoned.

## Environment and Sustainability

We will conduct business in an environmentally friendly and responsible manner. We will seek to reduce and minimize the environmental impact of all of our operations in the short term, as we seek to become an environmentally restorative and truly sustainable company in the long term.

## Responsibility and Implementation

We will communicate this Code of Basic Working Conditions to all employees. As appropriate under local practice, we will seek the support and assistance of unions and employee representatives in this effort. We will encourage our business partners throughout our value chain to adopt and enforce similar policies. We will seek to identify and utilize business partners who aspire in the conduct of their business to standards that are consistent with this Code.

Employees with a good-faith belief that there may have been a violation of this Code should report it through established channels, if known, or to the Office of the General Counsel at fordlaw@ford.com. No retaliatory actions will be taken against any employee who makes such a report or cooperates in an investigation of such a violation reported by someone else.

## Verification

We will, as appropriate, seek the assistance of independent third parties to verify our compliance with this Code.

# Working Conditions in Ford Plants



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Ford's Code of Basic Working Conditions applies to our own facilities as well as those of our joint venture companies and suppliers. Since 2004, we have conducted 41 formal assessments of Ford facilities, four of which were joint-venture facilities.

During 2008, we conducted assessments at our Santa Rosa plant in the Philippines, our Haiduong Assembly Factory in Vietnam and the Chicago Assembly Plant in Illinois. These three sites were selected by Ford's Sustainable Business Strategies and Supply Chain Sustainability functions based on the sites' impact on our supply chain, emerging issues and the views of thought leaders, nongovernmental organization representatives and human rights activists.

The process for assessing Ford facilities includes a questionnaire to be completed by facility management and a detailed review of documents related to the full range of working conditions issues (e.g., collective bargaining agreements, grievance procedure logs, employee hotline records and health and safety audit reports). The findings of the questionnaire and document review serve as the basis for interviews with facility management. Where procedures and/or documentation are lacking, or where we feel it would otherwise be valuable, the assessments also include facility visits.

The findings of the assessments are initially shared with human rights organizations with which Ford works and then published on our Web site. We have sought the opinions of neutral third parties who have visited plants and/or reviewed the assessment process, and they have agreed that the process is robust and has integrity.

The findings of the 2008 assessments were generally consistent with those of previous assessments. That is, they confirmed that Ford's wholly and majority-owned facilities are operating in compliance with our CBWC. Reflecting the expanded scope of the CBWC, the assessments also discuss and document community engagement efforts, effects on indigenous populations and environmental initiatives.

We have received considerable and consistent positive feedback from external stakeholders about the policies and systems in place at Ford facilities. While we and our stakeholders have confidence in our systems, we nonetheless believe it is important to continue conducting the assessments given that conditions can change and new issues emerge.

In 2009, we plan to continue to conduct assessments in select Ford facilities, corresponding to the priorities and activities of our Supply Chain Sustainability group.

## DOWNLOADS

- Santa Rosa Human Rights Assessment (pdf, 61kb)
- Camacari Human Rights Assessment (pdf, 111kb)
- Ford Motor Company of Southern Africa Human Rights Assessment (pdf, 85kb)
- Vsevolozshk Human Rights Assessment (pdf, 85kb)
- Chicago Human Rights Assessment (pdf, 79kb)
- Hermosillo Human Rights Assessment (pdf, 152kb)
- Michigan Human Rights Assessment (pdf, 106kb)
- Broad Meadows Human Rights Assessment (pdf, 133kb)
- Lio Ho Human Rights Assessment (pdf, 103kb)
- Pacheco Human Rights Assessment (pdf, 1.45Mb)
- Changan Human Rights Assessment (pdf, 56kb)
- India Human Rights Assessment (pdf, 41kb)
- Otosan Human Rights Assessment (pdf, 63kb)
- Vietnam Human Rights Assessment (pdf, 73kb)

# Ford and the Automotive Industry Supply Chain



Our complex global supply chain encompasses several thousand supplier facilities that employ a million people. (See Supply Chain Profile.) We aim to ensure that everything we make – or others make for us – is produced consistent with local law and our Code of Basic Working Conditions (CBWC). This can be challenging, as we have less control in suppliers' facilities than in our own, particularly at the sub-tier level (i.e., our suppliers' suppliers).

Since we began work with our suppliers to ensure alignment with our CBWC, our approach has emphasized building capability throughout the supply chain to manage working conditions effectively. Our primary focus has been on training and education about working conditions issues, in conjunction with assessments of individual suppliers in order to verify performance and progress. We are committed to collaborative action to more effectively influence all levels of the automotive supply chain.

Our long-term vision is for our industry as a whole to converge on a set of common expectations for the global automotive supply chain and then work together ensure that these expectations are met throughout the supply chain. We are working toward that goal comprehensively, with a three-pronged approach aimed at individual supplier facilities, supplier company management and auto company management. (See the "Expanding Impact on Working Conditions" graphic.)

**81,963**

Number of our suppliers' workers who have been trained in human rights based on our supplier outreach programs.

RELATED LINKS

In This Report:

- Supply Chain Profile
- Code of Basic Working Conditions
- Expanding Impact on Working Conditions

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# Supply Chain Profile[1]

## Production

(Anything that is part of the vehicle)

### 60+

Countries in which suppliers are located

### 36

Emerging markets in which suppliers are located

### 17

Emerging markets considered to have risks of substandard working conditions. These countries were identified as higher risk based on consultation with nongovernmental organizations, other companies with human rights experience, local Ford operations and various media and government reports.

### 105

Ford manufacturing sites

### 2,000+

Supplier companies

### 5,500+

Supplier manufacturing sites

### 130,000

Parts currently being manufactured

### 250+

Production commodities to manage

## Nonproduction

(Anything that is not in the vehicle, such as services, marketing, construction, computers, industrial materials, health care, machinery, trains)

### 9,000+

Supplier companies

### 600+

Nonproduction commodities

## TOTAL GLOBAL BUY

### $90+ billion

1. As of year end 2008. Includes Volvo.

# Expanding Impact on Working Conditions



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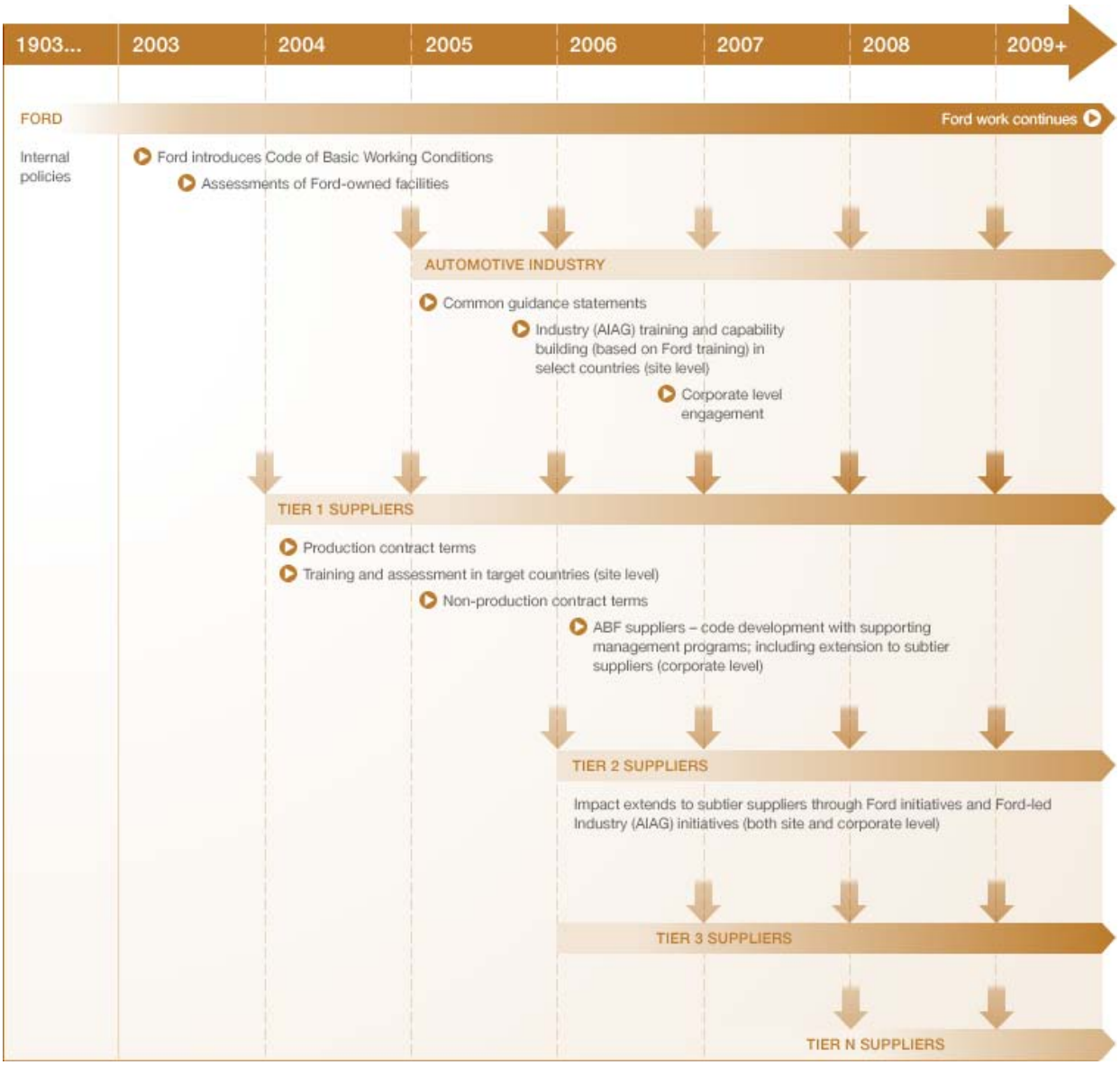

# Engagement with Individual Supplier Facilities





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Suppliers

## Setting Expectations for Our Suppliers

Every supplier doing business with Ford is subject to Ford's Global Terms and Conditions. This core contract reflects our prohibition of the use of forced labor, child labor and physical disciplinary abuse. These requirements were added in January 2004 for production suppliers and in September 2005 for all others. We have provided a standard for these areas – the same as we use in our own facilities (Ford's Code of Basic Working Conditions) – that supersedes local law if our standard is more stringent. The Global Terms and Conditions also prohibit any practice in violation of local laws.

In addition, the Global Terms and Conditions serve to:

- Set the expectation that suppliers will work toward alignment with our CBWC in their own operations and their respective supply chains in the areas of harassment and discrimination, health and safety, wages and benefits, freedom of association, working hours, bribery and corruption, community engagement, and environment and sustainability
- Make clear Ford's right to perform third-party site assessments to evaluate supplier performance
- Communicate that Ford can terminate the relationship for noncompliance or for failure to address noncompliance in a timely manner

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# Engagement with Individual Supplier Facilities



1,621 managers from 1,317 different supplier companies have completed a full day of training

## Building Supplier Capability

The primary focus of our work on human rights in our supply chain is building capability among our suppliers to responsibly manage working conditions. This includes meeting legal requirements and Ford's expectations, and promoting sound working conditions in their own facilities and supply chains. We have developed and delivered tailored training programs for Ford suppliers in select countries in cooperation with the Automotive Industry Action Group, a North American member-based, nonprofit industry group specializing in supply chain issues.

The training workshops emphasize the interpretation and application of legal standards and international best practice. By interacting with managers from the human resources, health and safety, labor affairs and legal departments of participating companies, the workshops provide for a two-way learning experience touching on the areas of interest for each company.

While Ford's supplier training sessions are customized to align with the unique laws, customs, cultures and needs of each location, in general they consist of:

- A day-long interactive workshop facilitated by qualified trainers and involving multiple automotive suppliers, in which participants develop and confirm an understanding of Ford expectations, local labor law, best practices and management systems
- A confirmed communication cascade for providing information obtained during the classroom training to all supplier personnel at each factory and direct sub-tier suppliers

During 2008, we held training workshops in China, Mexico and South Africa. Some 1,621 managers from 1,317 different supplier companies have completed a full day of training since the inception of the program in 2004. These suppliers have now moved on to the process of self-assessing their facilities for compliance with local law and Ford expectations, and completing the final stage of the program, which is communication to both workers and their own suppliers on the topic of working conditions expectations.

We continue to focus on the 17 countries we had previously identified as having higher risks of substandard working conditions. Among those countries, locations are prioritized based on production and sourcing trends, sales trends and relative perceived risk based on the input of human rights groups, other companies' experience and other geopolitical analysis. In 2009, we plan to conduct supplier training programs in Brazil, China, India, the Philippines, Romania, South Africa and Turkey.

### Working Conditions Program Countries

- **Americas**: Argentina, Brazil, Colombia, Mexico, Venezuela and Central America (Dominican Republic, Honduras, Nicaragua)
- **Asia and Africa**: China, India, Korea, Malaysia, the Philippines, South Africa, Taiwan, Thailand, Vietnam
- **Europe**: Romania, Russia, Turkey

RELATED LINKS

In This Report:

Working Conditions Assessment Status for Supply Chain

# Engagement with Individual Supplier Facilities



## Assessing Suppliers

Since 2003, we have conducted more than 550 assessments of existing and prospective suppliers in 20 countries. The assessments provide feedback to Ford and suppliers about how well they are meeting legal requirements and Ford's expectations. They also provide insight into the effectiveness of our training programs. Assessments consist of a detailed questionnaire, a document review, factory visits, and management and employee interviews, and are conducted with the assistance of external auditors.

In 2008, we conducted assessments across the target countries. The findings from the 2008 assessments were generally consistent with those we had previously conducted. Namely, they identified a wide range of general health and safety issues, several wages and benefits issues and a limited number of other types of noncompliance.

The findings from Ford's 2008 supplier assessments included:

- No evidence of forced labor or physical disciplinary abuse
- A range of general health and safety issues, including inadequate emergency systems
- In some cases, a lack of appropriate timekeeping systems, and thus a failure to pay correct overtime wages
- In some cases, a failure to pay the correct local minimum wage or overtime or to provide the correct social insurance
- A general need to clearly define policy on harassment and discrimination
- Limited cases of restricted workers doing hazardous work
- In some cases, limited or restricted access to appropriate documentation regarding subcontracted labor and privacy policies
- In some cases, nonpayment of company contributions to government-mandated social programs

In addition, freedom of association has been difficult to verify. While all assessed suppliers have either union representatives or a grievance process, there may be issues we have not been able to identify through our assessment process.

We continue to engage with our suppliers to develop and implement appropriate corrective action plans. Through this process, we have the opportunity to encourage change throughout the tiers of suppliers and affect positive change more broadly.

In 2009, we plan to conduct supplier assessments across the target countries as necessary.

# Engagement with Key Suppliers' Corporate Management



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Within our global supply base, we have long-term, strategic relationships with a select number of suppliers. Relationships with these suppliers are structured through our Aligned Business Framework (ABF), which is designed to create a sustainable business model to increase mutual profitability, improve quality and drive innovation. Since the ABF program began in 2005, Ford has approved a total of 65 ABF suppliers, 10 of which are owned by minorities or women.

The bilateral ABF agreements comprehensively and formally spell out 22 key business commitments to which Ford and the ABF suppliers must adhere. One element of the ABF agreement is the commitment by suppliers to manage and assure proper working conditions, and responsible environmental management, in their facilities and in their supply chain. (ABF suppliers must also adhere to our Global Terms and Conditions.) This commitment is important for several reasons. Beyond the simple fact that it is the right thing to do, there are specific business benefits to Ford and suppliers in reducing the risk of operational or reputational problems that could affect production. The commitment also provides an opportunity for joint action by Ford and its suppliers to ensure sound working conditions throughout the automotive supply chain.

Ford is facilitating this ABF commitment through a three-phase process, in which ABF suppliers are asked to:

1. Develop or verify that they have a code of conduct aligned with Ford's Code of Basic Working Conditions and internationally accepted principles,
2. Conduct internal awareness training and develop compliance processes supporting their code, and
3. Extend or cascade these expectations to their sub-tier suppliers.

Our work with ABF suppliers to date has focused on providing support and resources to help them align with Ford's CBWC and implement supporting processes. The majority of ABF suppliers have multiple policies and programs to manage some or all elements addressed by Ford's CBWC, however these tend to be disjointed and thus difficult to implement and manage in a cohesive manner.

Ford has committed to providing suppliers with a range of support and assistance based on our experience in this area. We have developed an in-depth resource guide to give suppliers information and background on human rights, generally, and on the development of their own codes, specifically. We are sharing the training materials we have developed, as well as information and developmental guidance on our compliance and training processes. Finally, we have committed to working with suppliers to help resolve issues and concerns.

During the fourth quarter of 2008, we held two sustainability sessions in Troy, Michigan, that were attended by senior management from Ford and our ABF suppliers. Topics covered in these meetings included internal training development guidance and discussion, and a review of key emerging environmental and sustainability topics of interest to Ford and our suppliers.

Through the ABF, Ford is making strides in improving its working relationships with suppliers on a global basis. We are particularly excited about our sustainability work with our ABF suppliers, which leverages our efforts to manage human rights and environmental responsibility issues in our supply chain in a more collaborative, in-depth, integrated and aligned manner. In our view, it will help embed ownership for social and environmental issues throughout our value chain, and lead to the development of more robust sustainable management systems across the automotive supply chain.

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Supply Chain

Suppliers

# Collaboration within the Automotive Industry



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Ultimately, we would like all automakers to take a coordinated approach to protecting human rights and environmental conditions in the supply chain. We promoted cross-industry collaboration beginning in North America and now extending to global manufacturers. Our view is that all participants in the supply chain – from the original equipment manufacturers (OEMs) such as Ford, to the suppliers themselves, to the government agencies that set and enforce the regulations governing operations – must be involved to make these efforts sustainable in the long run. Such collective action will not only minimize costs and increase efficiency for OEMs and suppliers alike, but will lead to better results than if individual companies take steps in isolation.

## Automotive Industry Action Group Initiative

Since 2004, Ford has worked with the AIAG to implement its capability-building program with global suppliers with the intent of leveraging that work with other automakers (see diagram below). Ford has taken an "open book" approach to its supply chain work and has contributed an "executive on loan" – the global manager of our Supply Chain Sustainability group – to the AIAG to support the industry's work and facilitate sharing what we have learned from working on these issues within our own operations. Materials developed within Ford to promote responsible working conditions have been offered to the group as a platform for use and development. In 2005, Ford, General Motors, Chrysler, Honda North America and Toyota North America began collaborative work to explore a cooperative industry approach to promoting decent working conditions in the supply chain.

Initiative participants have created a set of guidance statements to establish a shared industry voice on key working conditions issues. The statements cover the core elements of individual companies' codes and policies, joint codes created by other industries and key international standards. The guidance statements cover child labor, forced labor, freedom of association, harassment and discrimination, health and safety, wages and benefits, and working hours. These statements serve as a baseline agreed upon by all the participating OEMs and are used as a platform for training. It should be noted that Ford's specific expectations in the Ford CBWC for child labor exceed the expectations in the industry guidance statements.


## Training Workshops

Beginning in 2007, the sponsoring OEM manufacturers from the AIAG launched joint factory-level training workshops in China and Mexico. All training materials were based on Ford-developed training. With the support of the AIAG and the China Association of Automobile Manufacturers, the mandatory training in China reached 461 Tier 1 suppliers, including more than 300 suppliers to Ford's joint ventures in China. The information from these training sessions and expectations have in turn been cascaded to 21,799 people at the Tier 1 supplier level and to more than 2,100 Tier 2 suppliers.

AIAG participants engaged stakeholders and further developed training materials before the launch of a training program in Mexico. The work in Mexico was partially funded and supported by a $185,000 grant from the U.S. State Department to Business for Social Responsibility, a nonprofit group that works with companies to advance responsible business practices. This public-private partnership enabled relationship building with local industry associations, the Mexico national government and domestic suppliers in Mexico. As of year-end 2008, a total of 494 Tier 1 suppliers participated in the Mexico training, including more than 250 suppliers to Ford. The information from these training sessions and expectations have in turn been cascaded to 44,833 people at the Tier 1 supplier level and to more than 5,600 Tier 2 suppliers.

RELATED LINKS

External Web Sites:

Automotive Industry Action Group

AIAG Working Conditions Work Group

Business for Social Responsibility

Training sessions are planned to be offered during 2009 in Brazil, China, India and Turkey.

## Corporate Engagement Pilot

In December 2008, the AIAG and the five participating OEMs held two pilot working conditions training sessions targeted at senior management from the procurement organizations of their top supplier companies. The AIAG is actively evaluating further opportunities to expand these corporate engagement offerings in 2009.

## Next Steps – Industry Cooperation

The AIAG cooperative project continues to work on several fronts:

- Actively reaching out to others in the automotive supply chain, including global automakers and heavy truck manufacturers, industry associations, major automotive suppliers and cross-sectoral initiatives. Broader participation will be needed to achieve the vision of an industry-wide approach to promoting decent working conditions in the supply chain.
- Continuing to expand the training program to other countries.
- Increasing supplier ownership of working conditions issues through an expansion of engagement opportunities (i.e., development of e-learning programs and direct engagement in AIAG work groups).
- Development of additional resources and networks that will ensure the successful communication of working conditions expectations throughout the automotive supply chain.

# Continued Evolution



As the work at the AIAG develops and matures, Ford will maintain a leadership position in our work with the supply chain. We will continue to conduct our own training and assessment programs in countries not covered by AIAG programs. We will also seek further opportunities to strategically leverage our assessment data and training processes to enhance our overall approach to working conditions and environmental responsibility in the automotive supply chain.

In addition, we constantly monitor approaches developed by other organizations and industries in order to incorporate what they have learned into our approach. We will continue to pursue partnerships with direct suppliers that create ownership of working conditions within those supplier organizations. Clear, consistent communication and further business integration of processes that support responsible working conditions throughout the supply chain will be a key component of our continued work.

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# Data



The data relating to human rights is included in the Society section of this report.

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# Vehicle Safety



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During 2008 we:

- Achieved superior crash-test results
- Unveiled new accident avoidance features

We are continuously enhancing the safety of our vehicles and sharing safety research and technologies across all of our brands. In 2008, our efforts were once again rewarded, and we set new standards for safety test performance. Based on the independent measures listed below, Ford is now the industry leader in motor vehicle safety.

- Ford holds the most Top Safety Picks (awarded by the Insurance Institute for Highway Safety, or IIHS) of any vehicle manufacturer. Fourteen Ford vehicles earned this honor in early 2008 (compared with eight in 2007), including the 2009 Ford Taurus, Taurus X, Edge, Flex, Escape and Fusion; Mercury Sable, Milan and Mariner; Lincoln MKX and MKS; and Volvo S80, C70 and X90. To earn a Top Safety Pick, a vehicle must receive a rating of "good" in offset frontal impact, side impact and rear impact evaluations and offer electronic stability control.[1]
- For the 2009 model year, 24 Ford vehicles received five-star ratings for both frontal impact and side impact from the National Highway Traffic Safety Administration (NHTSA) in its U.S. New Car Assessment Program (NCAP) ratings, compared with 15 for the 2008 model year.
- The 2009 Ford Taurus is the safest-rated large sedan sold in America, with five-star NCAP crash ratings for frontal and side impact and "good" IIHS ratings in offset frontal impact, side impact and rear impact evaluations.
- The 2009 Ford F-150 is America's safest full-size pickup. It's the only pickup to earn five-star crash-test ratings in all categories from NHTSA ***and*** be named a Top Safety Pick by the IIHS.
- The 2009 model year Mustang Convertible earned five-star ratings in all categories of NHTSA NCAP.
- For the 2009 model year, the IIHS awarded 28 Ford vehicles with "good" ratings for frontal offset performance and 16 Ford vehicles with "good" ratings for side impact performance.
- In the most recent EuroNCAP assessments, the Ford Kuga and Ford Fiesta achieved Ford's first three-star ratings for pedestrian protection. These cars also joined the Focus, Mondeo, S-MAX and Galaxy in having best-in-class, five-star adult protection and four-star child protection ratings.
- EuroNCAP gave the Volvo XC60's WHIPS system the highest-possible score when it tested whiplash protection systems for the first time in 2008.
- The Ford Mondeo became the second Ford car (after the Focus) to be awarded a five-star rating in the Chinese New Car Assessment Program.
- The Ford Falcon was the first Australian-built car to be awarded five stars in the Australasian New Car Assessment Program (ANCAP).

In addition to achieving superior performance in government-sponsored safety tests, Ford received the following recognitions for the safety of its vehicles.

- In safety ratings published by the French magazine ***Auto Plus*** in February 2009, all six of the Ford vehicles assessed were rated as "good" (the highest rating). A Ford vehicle came first in three out of the five categories – the Focus was rated the #1 small family car, the Mondeo the #1 large family car and the Volvo XC60 the #1 SUV. In addition, the Focus received the highest score of all the cars assessed.
- Centro Zaragoza, the Spanish insurance organization, awarded the Ford Mondeo, Ford S-MAX, Volvo XC60 and Volvo XC90 with Best Safety Awards in their respective categories.
- Ford vehicles also recently performed exceptionally well in low-speed damageability bumper tests

PERSPECTIVES ON SUSTAINABILITY

Dr. Adrian K. Lund

President, Insurance Institute for Highway Safety and the Highway Loss Data Institute

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RELATED LINKS

Vehicle Web Sites:

- Ford Taurus
- Ford Taurus X
- Ford Edge
- Ford Flex
- Ford Escape
- Ford F-150
- Ford Fusion
- Ford Mustang
- Mercury Sable
- Mercury Milan
- Mercury Mariner
- Lincoln MKX
- Lincoln MKS
- Volvo S80
- Volvo C70
- Volvo XC60
- Volvo XC90
- Ford Kuga

carried out by Thatcham (a UK-based safety research organization), based on the international standard bumper test developed by the Research Council for Automobile Repairs. The Ford S-MAX was the only vehicle tested to achieve the highest rating.

- The Volvo XC60's new City Safety system has received awards in Europe and the U.S., from the following automotive publications and organizations:
  - *Autohoje* 2009 (Portugal)
  - *FuturAuto* 2009 (Belgium)
  - *L'Automobile Magazine* 2008 (France)
  - *Autocar* 2008 (Greece)
  - *Auto Motor und Sport*, Paul Pietsch Award 2009 (Germany)
  - NHTSA, Traffic Safety Achievement Award 2008 (US)
  - Thatcham, British Fleet World Honours Awards 2008 (UK)

This section outlines our vehicle safety performance over the past year. It includes a discussion of current vehicle safety challenges and opportunities globally, and how we manage vehicle safety within the Company. It also focuses on technologies we've developed, programs we support and research we are undertaking to promote safer driving, how we manufacture ever-safer vehicles and how we promote a safer driving environment. Particular emphasis is placed on recent developments in accident avoidance technologies. Finally, the section looks at the various ongoing collaborative efforts we are undertaking with other organizations related to vehicle safety.

Ford Fiesta
Ford Focus
Ford Mondeo
Ford S-MAX
Ford Galaxy
Ford Falcon

External Web Sites:

Insurance Institute for Highway Safety
National Highway Traffic Safety Administration
European New Car Assessment Programme
Australasian New Car Assessment Program
*Auto Plus*
Centro Zaragoza
Thatcham

1. The Ford F-150 met these requirements later in 2008, bringing Ford's total number of current Top Safety Picks to 15.

# Challenges and Opportunities



Print report

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Traffic safety is a growing public health challenge, particularly in developing countries. Worldwide, approximately 1.2 million people die each year in traffic accidents. The vast majority of those fatalities – more than 1 million – occur in countries with low- and middle-income economies.

The World Health Organization (WHO) estimates that deaths due to road traffic accidents will increase to 2.4 million in 2030, primarily owing to increased motor vehicle ownership and use associated with economic growth in low- and middle-income countries. In addition, road traffic accidents are expected to emerge as the fourth-leading cause of death in 2030 – rising from the ninth-leading cause in 2004.

Road traffic crashes are already the leading cause of death among young people between 15 and 19 years old, according to a new report published by the WHO. The report says that nearly 400,000 young people under the age of 25 are killed in road traffic crashes worldwide every year. Millions more are injured or disabled. The vast majority of these deaths and injuries occur in low- and middle-income countries.

Many of the traffic deaths in developing nations involve pedestrians and/or motorcycles. As mobility increases in developing markets, people initially use two-wheeled motor vehicles, and the incidence of traffic accidents rises. As people migrate to automobiles, traffic accidents and injury levels generally decrease.

During this transition, holistic solutions are required, including infrastructure improvements, the modification of road user behavior and the enforcement of traffic laws. According to the WHO, some of the most cost-effective measures for reducing traffic deaths and injuries include separating pedestrians from motor vehicles on roadways, installing traffic signals, enforcing traffic laws and mandating the use of safety belts.

One critical task is to educate drivers about the most important primary safety feature – safety belts. Continued improvements in vehicle safety are also very important, and we at Ford continue to take seriously our responsibility to build safe vehicles.

In both developed and emerging markets, it is increasingly important for road safety stakeholders to work together using an integrated approach to ensure the maximum benefits are delivered from any given safety initiative. To support this approach, we at Ford seek ways to partner with governments, nongovernmental organizations and other stakeholders to identify the best opportunities to promote safety based on real-world data. We have become more involved in encouraging new and innovative ways to modify road user behavior (for example, through new technologies, driver education efforts and working with government agencies such as the UK Driving Standards Agency) and encouraging infrastructure and enforcement improvements in the communities in which we operate.

This vehicle safety section details our latest efforts and achievements in all of these areas. Our mobility project considers these challenges and offers alternative urban mobility approaches for developed and emerging economies.

## Findings of the Materiality Analysis

We analyzed the importance of vehicle safety to our Company and stakeholders as part of the materiality analysis conducted for this report. In that analysis, vehicle safety was identified as one of a small set of material issues for the Company. Customers are showing greater concern for vehicle safety and making it a higher priority in purchase decisions, while other stakeholders, including nongovernmental organizations, tend to focus on particular aspects of safety. There is a trend toward increased regulation of vehicle safety worldwide, and inconsistent regulations can create barriers to trade. An emerging societal and competitive issue for us at Ford is how to respond to the growing consumer interest in in-vehicle communication, navigation and entertainment systems while maintaining or improving vehicle safety (see Materiality Analysis).

RELATED LINKS

In This Report:

Materiality Analysis

Mobility

External Web Sites:

World Health Organization

# How We Manage Vehicle Safety



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Here at Ford, our objective is to design and manufacture vehicles that achieve high levels of vehicle safety for a wide range of people over the broad spectrum of real-world conditions. Real-world safety data, research, regulatory requirements and voluntary agreements provide much of the input into our safety processes, including our Safety Design Guidelines (SDGs) and Public Domain Guidelines (PDGs). (See graphic below.) The SDGs are Ford's stringent internal engineering design targets that exceed regulatory requirements and define many additional requirements that are not regulated. The PDGs are Ford guidelines that focus specifically on helping to ensure that our vehicles earn top marks in relevant public domain assessments.

Both SDGs and PDGs are managed on a global basis and address the local needs of individual regions and markets. Awareness of road safety is rapidly increasing in many emerging markets, most notably in China, where vehicle safety performance is quickly catching up to that of mature markets. In 2008, Ford created new China-specific SDGs and PDGs to address this issue – raising the bar for vehicle performance in this emerging market beyond regulatory requirements.

Government-run New Car Assessment Programs are becoming an increasingly important tool to improve consumer awareness in emerging markets such as China, but their relevance in developed markets is still also very strong. This is likely to remain the case between 2009 and 2012 as both the National Highway Traffic Safety Administration NCAP and EuroNCAP ratings systems are being significantly altered. As such, fewer vehicles (of all makes) will receive top ratings. Ford is working hard to meet this challenge. We have taken active roles working with NHTSA and EuroNCAP to help ensure the respective rating schemes will be appropriate and will deliver additional real-world benefit. Ford is continuing to work with NHTSA to address several remaining concerns about the new NCAP test requirements before they are implemented.

Ford utilizes engineering analyses, extensive computer modeling and crash and sled testing to evaluate the performance of vehicles and individual components. These rigorous evaluations help to confirm that our vehicles meet or exceed regulatory requirements and our even more stringent internal guidelines. Our state-of-the-art crash-test facilities include the Safety Innovation Laboratory in Dearborn, Michigan, the Volvo Car Safety Centre in Gothenburg, Sweden, and the extensive crash-test facilities in Merkenich, Germany, and Dunton, England.


## Global Technical Regulations

The automotive industry is highly regulated, and two systems of vehicle regulation currently predominate globally: the United Nations Economic Commission for Europe (UNECE) Regulations and the U.S. Federal Motor Vehicle Safety Standards. A limited number of countries (including Canada and Mexico) base many of their regulations on U.S. requirements, but the members of the European Union (EU) and much of the rest of the world are increasingly adopting the UNECE regulations or regulations based upon them.

When countries or regions have different regulatory requirements or add unique additional requirements

RELATED LINKS

External Web Sites:

National Highway Traffic Safety Administration

European New Car Assessment Programme

Global Technical Regulations

to standard U.S. or UNECE regulations – purportedly to meet the same overall safety objectives – manufacturers must modify their vehicle designs and features to meet the different regulations of the various markets. This increases vehicle complexity and cost, usually with no additional real-world safety benefit.

With the aim of harmonizing world vehicle regulations, the so-called "1998 Agreement" was established.[1] The 1998 Agreement has the backing of all the world's major vehicle-producing countries. At present there are 31 contracting parties to the Agreement, including the United States, Japan, Canada, Russia, South Korea, South Africa, India, the EU and a number of individual EU member states. As a result of the 1998 Agreement, which is administered by UNECE Working Party 29, the signatory countries have begun to work together to develop harmonized Global Technical Regulations (GTRs).

Ford Motor Company participates in the GTR development process. The first GTR was published in 2004, and since then eight more have been developed. GTRs for head restraints, safety glazing, electronic stability control systems and pedestrian protection were completed in 2008.

Progress toward true harmonization (i.e., complete alignment of regulations within a GTR) has been challenging, due to the difficulty of reconciling varied national requirements and the historical differences of existing regulations. Despite these challenges, Ford continues to believe that harmonization has the potential to significantly reduce global complexity while maintaining high levels of vehicle safety, security and environmental performance, and we will continue to support the harmonization of global regulations via the 1998 Agreement.

1. Officially, "The 1998 Agreement Concerning the Establishing of Global Technical Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles."

# Performance



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Vehicle safety is the product of complex interactions among the driver, the vehicle and the driving environment. We use the Haddon Safety Matrix (developed by William Haddon, a former NHTSA administrator and IIHS president) to take a holistic view of the factors that affect vehicle safety.

The Haddon Matrix looks at injuries in terms of causal and contributing factors, including human behavior, vehicle safety and the driving environment. Each factor is then considered in the pre-crash, crash and post-crash phases. In the pre-crash phase, the focus is to help avoid the crash. In the crash and post-crash phases, the primary objective is to help reduce the risk of injury to occupants during and after a collision. Another goal is to minimize the amount of time that elapses between the crash and when help arrives.

## Haddon Safety Matrix

Click on the column headers for information and examples of our activities in each area

| | HUMAN BEHAVIOR | VEHICLE SAFETY | ENVIRONMENT |
|---|---|---|---|
| |  |  |  |
| **Pre-Crash** (accident avoidance) | ▪ Research<br>▪ Education<br>▪ Advocacy | ▪ Crash avoidance technologies<br>▪ Security | ▪ Road design for accident avoidance<br>▪ Traffic control |
| **Crash** (occupant protection) | ▪ Technology and proper use | ▪ Crashworthiness | ▪ Road design for injury mitigation<br>▪ Research |
| **Post-Crash** (injury mitigation) | ▪ Telematics | ▪ Post-crash notification | ▪ Emergency medical services |
| **Examples of Ford Actions** (detailed in this section) | ▪ SYNC® technology<br>▪ MyKey™<br>▪ Driving Skills for Life<br>▪ See Me Safe | ▪ SYNC® with 911 Assist<br>▪ Accident avoidance features<br>▪ Roll Stability Control® | ▪ Global Road Safety Partnership<br>▪ Accident research |

# Human Behavior



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BACK TO PERFORMANCE OVERVIEW

## Safer Driving

The U.S. Department of Transportation reports that human factors cause or contribute to more than 90 percent of serious crashes.

In the pre-crash stage, drivers can try to avoid crashes by practicing safe driving. In the crash and post-crash phases, drivers can help reduce the risk of injury by always properly using safety equipment such as safety belts. Ford Motor Company provides information, educational programs and advanced technologies to assist in promoting safe driving practices.

For example, numerous studies show that hands-free multimedia devices offer safety benefits compared to hand-held devices. The benefits are seen in driving performance as well as object and event detection. Ford's popular and award-winning **SYNC®** technology, powered by Microsoft®, provides a way for drivers to use cell phones and MP3 players more safely, because they can do so through voice commands alone while keeping their eyes on the road and their hands on the wheel. Ford SYNC was launched in late 2007 and is now available on nearly every vehicle from Ford, Lincoln and Mercury.

Beginning this year on select 2010 models, SYNC will be available with **Traffic, Directions and Information**, a subscription service that will allow drivers to access traffic reports, turn-by-turn directions and business news and information, all via voice command. Also, SYNC will be launched progressively on Ford's European product range beginning in 2010. (See the case study in this section for more on how SYNC helps to reduce driver distraction.)

In Europe, Ford currently offers the award-winning **Ford Convers+ Human Machine Interface System**. Available on the Mondeo, S-MAX and Galaxy, this system allows the driver to control multimedia functions such as cell phones, the navigation system and the radio via a five-way toggle on the steering wheel. A display screen is located on the instrument panel cluster. This combination of steering wheel toggle and cluster operation enables drivers to control multimedia devices with their hands on the wheel and eyes on the road. SYNC will complement FordConvers+ when it is introduced into the European line-up starting in 2010.


MyKey™ Insistent Beltminder™: If the MyKey driver and/or passenger does not buckle, then the vehicle will display a warning and mute the audio system.

Ford's **MyKey™** system is an innovative new technology designed to help parents encourage their teenagers to drive more safely. MyKey allows owners to program a key that can limit the vehicle's top speed to 80 mph and the audio volume to 44 percent of total volume. MyKey encourages safety-belt usage by enabling Ford's Beltminder™ to chime every minute indefinitely until the safety belt is buckled, rather than ceasing after five minutes, and also by muting the audio system until the belt is buckled. In addition, MyKey provides an earlier low-fuel warning (at 75 miles to empty rather than 50); sounds speed-alert chimes at 45, 55 or 65 miles per hour; and will not allow manual override of other safety systems. MyKey will debut as standard equipment on the 2010 Focus coupe and will quickly become

**5,400**
Driving Skills for Life participants in Asia to date

**778**
schools in Illinois participated in Operation Teen Safe Driving

RELATED LINKS

In This Report:
Driver Distraction

Vehicle Web Sites:
Ford Focus
Ford Mondeo
Ford S-MAX
Ford Galaxy

External Web Sites:
SYNC®
Driving Skills for Life
Traffic Improvement Association
See Me Safe

standard on many other Ford, Lincoln and Mercury models.

Driving Skills for Life (DSFL), Ford's driver education program, demonstrates our continued commitment to educating teens about safer driving. In 2008, Ford launched DSFL in the Philippines, Vietnam, Thailand and Indonesia, and has had more than 5,400 driver participants in those markets thus far. See the case study on this topic for more detailed information.

In the U.S., the DSFL program earned Ford the 2007 Traffic Safety Achievement Award for Community Service from the World Traffic Safety Symposium at the 2007 New York Auto Show. The U.S. program provides outstanding learning tools, including a DVD, printed materials and a redesigned Web site, to help young drivers improve their ability behind the wheel. In addition, the program includes information about eco-driving, car care tips and information for mature drivers.

Beginning in 2007, Ford partnered with the state of Illinois to launch a statewide effort – modeled on Driving Skills for Life – designed to reduce teen crashes and fatalities. Called Operation Teen Safe Driving, this campaign was the first of its kind and got high school students directly involved by challenging them to develop and implement a teen safe driving community awareness campaign using DSFL resources. This seven-month statewide effort involved 778 schools in 102 Illinois counties, and had the support of the governor, the secretary of state and the Chicago board of education.

The results were remarkable: Teen fatalities in the state fell by more than half in the year following the program's implementation, from 57 fatalities during January 1 – April 15, 2007, to 22 during January 1 – April 15, 2008. Based on this success, the program will now be expanded to include eight additional states and five additional cities.

Drivers aged 65 and over have the highest accident and traffic fatality rates among all age groups except for teenage drivers. Ford has recently redoubled its efforts to promote safer driving among older drivers, via the sponsorship of a pilot program with the nonprofit Traffic Improvement Association (TIA). This program enables older drivers to test their skills and evaluate their ability to safely operate motor vehicles. The TIA presented 38 Ford-sponsored, three-day workshops at hospitals and senior centers around Michigan in 2008, and even more will be offered in 2009. The classroom portion of the workshop, which educates older motorists about the effects of aging on reflexes and cognitive skills, teaches compensation skills for diminished abilities and reinforces fundamental defensive driving techniques. The program includes an on-the-road evaluation conducted by certified instructors in the students' own vehicles.

In another effort to promote safe practices, Ford has created – in partnership with Meharry Medical College – See Me Safe, a child passenger safety seat initiative aimed at reducing child injury, disability and death due to traffic accidents. Launched in 2007, See Me Safe is an educational program designed to reach families and the medical community. The program acknowledges the important role that health care providers play in educating parents about child passenger safety. Toward that end, See Me Safe is working to establish a supportive network of physicians, nurses, medical interns and pediatric trauma response teams, through which parents can learn about the proper use of safety restraints for their children. See Me Safe has distributed 750 car seats and reached 125 health care providers through its Prescription for Safety workshop. In 2009, See Me Safe will partner with organizations in Nashville, Tenn., San Antonio, Tex., and Phoenix, Ariz., on this initiative.

# Vehicle Safety



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BACK TO PERFORMANCE OVERVIEW

## Safer Vehicles



## Accident Avoidance Technologies

A variety of technologies, in addition to a vehicle's handling and braking capabilities, can help drivers avoid accidents. These technologies are generally not necessary for attentive drivers in most road conditions, but may provide added benefits for drivers who become distracted or experience challenging road conditions.

For example, Ford's new **Rearview Camera with Guidelines** can enhance rear visibility. It uses an exterior camera embedded in the rear of the vehicle that sends images to a video display in the rearview mirror or the navigation system screen. These images can help improve visibility directly behind the vehicle when the driver is in reverse. The camera image is overlaid with lines that mark the width of the vehicle, which makes it easier to gauge distance and navigate in reverse. The system increases visibility in low light by using a low-light-capable camera and high-intensity reverse tail lights. The system not only enhances reverse driving, it can also assist with actions that require reverse maneuverability, such as parallel parking and hitching trailers. This system will be offered on most of Ford's full-size pickups, vans and crossovers – including the new 2009 Ford F-150.

2010 Ford Escape Rearview Camera with Guidelines

Ford is continuing its development of accident avoidance features that use forward-looking radar and vision sensors. These features are being developed to help warn drivers of potentially dangerous situations, such as unintended lane departures, pedestrians in the roadway or following a vehicle too closely. These technologies are being developed by a joint team in Dearborn, Michigan; Merkenich, Germany; and Gothenburg, Sweden. Some of these features are now available on selected Ford and Volvo vehicles.

**Adaptive Cruise Control** (ACC), for example, helps drivers maintain a safe distance from the vehicle in front of them. It is one of the innovations now available on the 2009 MY Lincoln MKS, as well as the Volvo XC60, S80, XC70 and V70, and the Ford Mondeo, S-MAX and Galaxy. While primarily a comfort and convenience feature, Adaptive Cruise Control also contributes to more controlled driving when traffic flow is uneven. The ACC module is mounted at the front of the vehicle and uses radar to measure the gap and closing speed to the vehicle ahead. The system automatically adjusts the speed

RELATED LINKS

Vehicle Web Sites:
- Ford Taurus
- Ford Flex
- Ford Explorer
- Ford SportTrac
- Ford Expedition
- Ford Escape
- Ford Escape Hybrid
- Ford F-150
- Ford E-Series
- Mercury Mountaineer
- Mercury Mariner
- Mercury Mariner Hybrid
- Lincoln Navigator
- Lincoln MKX
- Lincoln MKS
- Volvo XC70
- Volvo V70
- Volvo S80
- Volvo XC60
- Volvo XC90
- Ford Mondeo
- Ford S-MAX
- Ford Galaxy

of the car to help maintain a pre-set distance from the vehicle in front. Ford was the first manufacturer to launch radar-based ACC several years ago.

On Volvo vehicles, Forward Collision Warning with Auto Brake comes as part of the ACC package and uses radar technology to help avoid or reduce the effects of rear-end collisions. The area in front of the car is monitored by a radar sensor. If the equipped vehicle approaches another moving vehicle from behind and the driver does not react, a visual and audible warning signal is activated. The system is designed to provide sufficient time for the driver to react and avoid or reduce the hazard. If the risk of collision increases despite the warning, Auto Brake is activated. This system supports driver-initiated braking by pre-charging the brakes and preparing for panic brake application, and then brakes automatically if a collision remains imminent. A similar system will be available on the 2010 Ford Taurus and Lincoln MKS.

The next generation of these preventative safety technologies was unveiled this year at the Detroit Auto Show on the Volvo S60 Concept vehicle. The S60 Concept featured Collision Warning with Full Auto Brake and pedestrian detection. This advanced radar- and camera-based technology reacts when a pedestrian walks in front of a car, and will activate the car's full braking power if the driver does not respond to the danger. The radar has a widened field of vision, which allows it to detect the moving pattern of a pedestrian. The automatic full braking power – a first in the industry – is an emergency measure that is designed to activate when a collision with a pedestrian or vehicle is imminent. The S60 Concept also included an upgraded Adaptive Cruise Control system that maintains a set time gap to the vehicle in front all the way down to a standstill (rather than to 30 km/h, as at present). These next-generation technologies will be introduced on the all-new Volvo S60 in 2010.

Driver Alert Control and Lane Departure Warning are two other forward-looking-radar-based features recently launched on the Volvo XC60, S80, V70 and XC70. These systems are designed to help address driver fatigue, which is a traffic safety concern worldwide. The Driver Alert Control and Lane Departure Warning features use a forward-looking camera to continuously monitor the road and keep track of where the car is in relation to the lane markings. The system is designed to sense if the driver loses concentration or the vehicle's wheels move outside the lane markings without an obvious reason, such as use of a turn signal. In that case the system provides a warning chime to alert the driver. This patented system has been tested both on roads and in simulators and is unique among vehicle manufacturers.

Volvo has also introduced a unique new and award-winning system called City Safety, which will help drivers avoid the sort of low-speed collisions that are common in slow-moving urban traffic. If a driver is about to collide with the vehicle in front and does not react in time, the City Safety system is designed to activate the brakes to slow the vehicle. City Safety is active at up to 30 km/h.

City Safety works via an optical laser system integrated behind the top of the front windscreen. It can monitor vehicles up to six meters from the front of the car. If the vehicle in front suddenly brakes and City Safety senses that a collision is imminent, it pre-charges the brakes to help the driver avoid an accident by braking or letting the driver steer away from a potential collision. The City Safety feature allows driver-initiated interactions (steering or braking) to override the City Safety system. Volvo introduced City Safety as standard equipment on the Volvo XC60 in late 2008.

Another important Ford safety innovation is the next generation of adaptive headlamps. With a unique two-part optics package, the Adaptive Front Lighting System (AFLS) is an industry breakthrough that allows drivers to see better at night around curves in the road. Most cornering, or swivel, lighting systems are one-piece modules that turn as a single unit with the vehicle as it approaches a curve. In contrast, the AFLS incorporates two independent light sources: a high-output halogen projector for the main beam and a secondary row of light-emitting diodes that illuminates almost instantaneously, distributes the light beam evenly and consumes less power than conventional lights. The system allows drivers to take corners and curves more safely, and to consume less energy while doing so. The AFLS was unveiled on a concept vehicle at the 2006 North American International Auto Show and is now available on a number of vehicles across the Ford fleet, both in North America and Europe.

Finally, Ford's industry-leading innovation known as Roll Stability Control® (RSC) continues to give drivers more confidence in emergency situations. Ford and its global brands have built more than four million vehicles globally with electronic stability control systems. To date, more than one million of those vehicles feature AdvanceTrac® with Roll Stability Control, which actively measures and helps control both yaw and roll movements. RSC uses two gyroscopic sensors to detect when a driver corners too fast or swerves sharply to avoid an obstacle. It then applies pressure to select brake(s) to help the driver maintain control and thus reduce the risk of a rollover event.

Roll Stability Control was first introduced on the 2003 Volvo XC90 and is now standard equipment on the Ford Flex, Explorer, SportTrac, Expedition, Edge, Escape and F-150, as well as E-Series Wagons equipped with the 5.4L engine. It is also standard equipment on the Mercury Mountaineer and Mariner, the Lincoln Navigator and MKX, and the Volvo XC60. Ford has developed a next-generation regenerative braking system for the 2009 Escape Hybrid and Mariner Hybrid that is compatible with RSC.

Percent of North American Nameplates with Standard Offering of Electronic

## Stability Control or Roll Stability Control

| | *Percent* |
|---|---|
| 2010 Model Year | 77% |
| 2009 Model Year | 62% |
| 2008 Model Year | 40% |
| 2007 Model Year | 27% |

# Vehicle Safety



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BACK TO PERFORMANCE OVERVIEW

## Safer Vehicles



## Occupant Protection Technologies

Many factors influence a vehicle's crashworthiness, including the design of the vehicle's structure to absorb impact energy and the use of passive safety equipment such as air bags. To help protect drivers and passengers in the event of a crash, a variety of Ford technologies have been designed to enhance the performance of safety belts and air bags and provide additional occupant protection in side crashes and rollovers.

The Safety Canopy

Ford was the first in the industry to offer rollover-activated side-curtain air bags, known as the **Safety Canopy®**, beginning with the Ford Explorer and Mercury Mountaineer in 2002. Today, the Safety Canopy with rollover sensors – which helps reduce the risk of injury to vehicle occupants during side-impact collisions and rollover accidents – is available on most Ford vehicles, including the Ford Focus, Fusion, Taurus, Taurus X, Flex, Edge, Escape, Explorer, SportTrac, Expedition and F-Series; the Mercury Milan, Sable, Mariner and Mountaineer; and the Lincoln MKZ, MKS, MKX and Navigator. By the 2010 model year, all Ford, Lincoln and Mercury retail SUVs and crossovers, as well as vans and trucks under 8,500 lbs., are planned to have the Safety Canopy as standard equipment. Ford already has more than 1.5 million vehicles on the road with Safety Canopy rollover-activated curtains.

RELATED LINKS

Vehicle Web Sites:
- Ford Focus
- Ford Fusion
- Ford Taurus
- Ford Taurus X
- Ford Edge
- Ford Flex
- Ford Escape
- Ford Explorer
- Ford SportTrac
- Ford Expedition
- Ford F-150
- Mercury Sable
- Mercury Milan
- Mercury Mountaineer
- Mercury Mariner
- Lincoln MKZ
- Lincoln MKX
- Lincoln MKS
- Lincoln Navigator
- Volvo V70
- Volvo XC70
- Ford Mondeo
- Ford S-MAX
- Ford Galaxy

SPACE™ Architecture

The 2009 Ford Taurus, Taurus X, Flex, Mercury Sable and Lincoln MKS have been engineered with crush zones designed to direct excess energy around the passenger compartment into a high-strength frame. This advanced engineering design – known as SPACE™ Architecture – utilizes crash form management techniques to help channel impact forces around and away from the passenger cabin.

Integrated two-stage booster seat, which helps to protect children who have outgrown their toddler seat

Another new technology – which launched on the 2008 Volvo V70 and XC70 and received numerous accolades – is the integrated two-stage booster seat, which helps to protect children who have outgrown their toddler seat. The system received *Popular Science*'s annual Best of What's New award, as well as the World Traffic Safety Symposium's award for best new safety feature, presented at the 2007 New York International Auto Show.

With this system, a separate booster cushion is not required; instead, the base of the rear seats lifts up, placing the child in the correct position relative to the safety belt. The system includes two settings: the upper setting is designed for children measuring 95–120 cm and weighing 15–25 kg, while the lower setting is intended for children 115–140 cm in height and weighing 22–36 kg. When the integrated boosters are not raised, the seats are indistinguishable from rear seats without this option, and both fold flat to expand the cargo compartment.

In Europe, the Ford Mondeo, S-MAX and Galaxy are equipped with an Inflatable Knee Bolster, designed to help reduce the driver's forward motion in the event of a severe frontal crash and reduce the risk of injury to lower limbs. This technology is expected to be available on select Ford vehicles in the U.S. for the 2010 model year.

Safety belts remain the most important vehicle safety technology available. Responding to the changing demographics of today's driving population, Ford is researching advanced, next-generation safety belt technologies that could help to further reduce the number of annual vehicle fatalities, which are already at their lowest levels since 1994 in developed countries.

One new design under development, envisioned for possible use in rear seats, incorporates an air bag into the safety belt itself. In this design, a tube of air bag material is hidden in the safety belt webbing, and the tube inflates into a cylindrical shape when the frontal air bags deploy. The inflatable belts have the potential to spread the forces from a vehicle crash over a broader section of the body than a traditional safety belt, which may help to reduce pressure on the chest. At the same time, the bag may help to control the motion of the head and neck.

Research and evaluations have shown that the inflatable belt may effectively enhance the protection of occupants in the rear seat, including children and the elderly. When not inflated, the thicker belt was judged in consumer clinics to be more comfortable than a standard safety belt, because it felt like it was padded. A developmental version of the inflatable belt system was shown on a concept car at the Detroit Auto Show in January 2006.

Finally, as smaller and more fuel-efficient vehicles become more popular, the safety of smaller cars is sometimes raised as a concern. Ford's study of accident trends found that fatality rates for small cars of the 1990s were lower than for large cars of the 1970s, due to improvements in vehicle safety, changing driver behavior such as increased seat-belt usage and generally safer road infrastructure.

Ford's focus is to continue making small cars even safer while building larger vehicles that are more crash compatible with smaller vehicles. We've already lowered the front bumper structures on most of our crossovers, SUVs and pickups to help them better match up with small vehicle crash structures. We also are taking weight out of larger vehicles while helping to maintain their crashworthiness with advanced, high-strength yet lightweight material in crash structures. The all-new 2009 F-150 is a good example with use of boron – the strongest weldable metal – and other exotic materials in the crash structure that helped us achieve the segment's best crash-test ratings and unsurpassed fuel economy while maintaining the vehicle's weight even as we added more standard safety equipment.

# Vehicle Safety



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## Safer Vehicles



## Post-Crash/Injury Mitigation Technologies

One method of assisting emergency responders to reach the scene of a vehicle crash quickly is through in-vehicle emergency call systems, also called post-crash notification. These systems enable a driver to summon assistance in an urgent situation either automatically (if, for example, an air bag deploys) or at the touch of a button.

In the U.S., Ford **SYNC®** is a new, award-winning, in-car connectivity system that was introduced on certain 2007 model year vehicles. Beginning with the 2009 model year, SYNC-equipped vehicles come with an all-new occupant communications capability called **911 Assist**. In the event of a crash, the ability to directly contact the local 911 emergency operator could be critical, for both the vehicle occupants and first responders. While any cell phone alone could be used in an emergency situation, SYNC can assist in placing a call to a local 911 emergency operator – when a phone is properly paired, turned on and connected to SYNC and where the system and cell phone remain powered and undamaged – should a crash with an air bag deployment or fuel shutoff switch activation occur. The key advantage of SYNC 911 Assist is speed, as calls are placed directly to local 911 operators and do not have to be routed through a call center (as in competitors' versions), which can delay the time it takes to get help on the way. SYNC 911 gives the occupants a choice as to whether or not to make the emergency call, and places the call if the occupant does not respond after a short time.

This voice-activated feature will be available to customers with 2008 model year SYNC-equipped vehicles through a dealer-installed software update. SYNC's 911 Assist will be launched progressively in Ford's European product range beginning in 2010.

In late 2004, Ford, via its membership in the European Automobile Manufacturers' Association, signed a memorandum of understanding (MOU) regarding the development of a pan-European, in-vehicle emergency call system dubbed "eCall." The purpose of the MOU is to promote the development and implementation of eCall systems throughout Europe, in order to improve the number of vehicles reached by emergency responders within a short period of time.

The **On Call system** – a GSM- and GPS-based emergency and assistance system[1] – is currently available on Volvo vehicles. It is sold and operational in 13 European countries, including Russia, and is working across borders in an additional two European countries. With the On Call system Ford has made and will continue to make significant progress toward increasing the availability of eCall technology on vehicles in Europe.

The **SOS-Post Crash Alert System**, newly released as standard equipment on Ford's 2009 Taurus, is another important advance in post-crash safety technology. The SOS-Post Crash Alert System automatically activates the horn and emergency flashers (and the second-generation system automatically unlocks vehicle doors) in the event of an air bag deployment or safety belt pretensioner activation. The system is designed to alert passersby and emergency services to the vehicle's location.

1. GSM = Global System for Mobile communications; GPS = Global Positioning System

RELATED LINKS

In This Report:
Driver Distraction

Vehicle Web Sites:
Ford Taurus

External Web Sites:
European Automobile Manufacturers' Association

# Driving Environment



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## Safer Roadways

The driving environment includes physical infrastructure (roads, signs, traffic lights, etc.) and the condition and maintenance of that infrastructure. Increasingly, information technologies play a role in the driving environment – for example, by controlling the timing of traffic lights. All of these factors have a significant influence on traffic safety.

Safety challenges related to the driving environment vary between countries and between developed and developing economies. Around the world, we work with government agencies and private-sector partners to promote road safety.

In Europe, Ford has been taking a leadership role in two major accident research activities, in cooperation with public bodies. These activities are the **German In-Depth Accident Study** (GIDAS) and the United Kingdom's **Co-operative Crash Injury Study** (CCIS). GIDAS is a statistically representative, "on-the-spot" study that allows for the analysis of pre-crash factors and pedestrian impacts. The CCIS is a retrospective, statistically stratified study with a particular focus on seriously injured occupants. Both studies are jointly funded by government and industry, demonstrating a partnership approach to understanding real-world safety issues. Ford sees these two different but complementary studies as key components of its policy of data-driven decision making, both internally to ensure that our safety strategy is targeted at the most productive areas, and externally to help governments focus their rulemaking attention on genuine safety issues, where they can make a difference.

In late 2004, working in partnership with General Motors, Honda, Michelin, Renault, Shell and Toyota, Ford helped to found the **Global Road Safety Initiative** (GRSI). The purpose of the GRSI is to transfer best practices, with the objective of reducing accidents and building capacity in developing countries to manage road safety. Projects include educational outreach to increase safety belt and helmet usage rates, and training aimed at improving roadway design.

Ford and other participating companies have pledged a total of $10 million to the GRSI over five years to fund important road safety projects in China, Brazil and countries in the Association of Southeast Asian Nations. The projects are being implemented through the Global Road Safety Partnership, an existing organization founded by the World Bank and national governmental aid organizations. Ford serves on the Partnership's Executive Committee and is actively involved in project execution. The projects rely on delivery through local organizations, so those organizations can build capacity and continue their work long after the projects are completed.

Also in China, Ford is cooperating with the China Automotive Technology & Research Center (CATARC) and the Chinese Ministry of Public Security to launch a new project that aims to provide accurate and scientific data for research into **road safety in China**. As part of that project, Ford took part in a workshop in Shanghai in January 2007 that brought together road safety experts from the United States, Europe and China to exchange information and experience, as well as to define a road safety project that will help establish a "glide path" for rapidly reaching an accident reduction target.

In addition, Volvo Car Corporation, the Volvo Group and CATARC have launched a project on traffic accident research in China to analyze accident statistics. The aim is to assist decision makers in prioritizing among traffic safety activities.

In Australia, the **Australian National Crash In-depth Study** (ANCIS), of which Ford is a founding member, is an unprecedented collaboration among major Australian vehicle manufacturers, federal and state governments, insurance companies and automobile clubs. Established in 1999 and managed by the Monash University Accident Research Centre, ANCIS provides a means for collecting detailed information about representative automobile crashes in Australia, to examine crash and injury trends and monitor emerging problems. The study's objectives have recently been expanded from a focus on vehicle crashworthiness to include crash involvement factors such as infrastructure and driver behavior.

RELATED LINKS

External Web Sites:

German In-Depth Accident Study
Co-operative Crash Injury Study
Global Road Safety Initiative
Global Road Safety Partnership
China Automotive Technology & Research Center
Australian National Crash In-depth Study

The unique arrangement of stakeholders involved in ANCIS has resulted in a much greater understanding among all parties of the systemic nature of road crashes. Ford continued to support ANCIS during 2008.

# Other Technologies and Research



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## Active Safety Research

Ford is undertaking a number of research efforts to assess and verify the effectiveness of new active safety technologies, such as those using forward-looking radar and vision sensors. For example, Ford, Volvo and the National Highway Traffic Safety Administration are jointly conducting a two-year study – the Advanced Crash Avoidance Technologies study – to develop methodologies for measuring and evaluating these technologies. This study will conclude in 2009.

One particularly creative research technique Ford has been using involves driving cars with Forward Collision Warning with Brake Support into large "balloons" nearly the size and shape of real cars. The purpose of these tests is to assess the accuracy of the radar and the timing of the warning signals and braking pre-charge. The balloons play the role of a "target" vehicle, allowing Ford engineers to assess the radar and braking features without endangering test drivers or damaging real cars. The balloons offer enough "give" to allow impact without injury. Ford uses about a dozen balloon cars in different sizes, each made from tarp-like material and weighing more than 40 pounds.

Ford testing new active crash-avoidance technologies

## Servo Sled

In the fall of 2005, Ford commissioned the Servo-Hydraulic Reverse Crash Simulator, known as the Servo sled. This state-of-the-art system is reducing the time and resources required for Ford to research, design and build a new car or truck. Located inside Ford's Safety Innovation Lab in Dearborn, the Servo sled is the most capable crash simulator of its type in the world.

The Servo sled builds on the basic principle of the Hyge sled, a crash test simulator Ford has used for more than 40 years. The Hyge and Servo sleds each sit inside a corridor about the width of a two-lane highway and about 50 yards long. A track runs the length of the corridor with the sled on top of it. On top of the sled sits a "buck" – an accurate representation of the interior of the vehicle to be tested (including seats, instrument panel, windshield, airbags, seat belts, etc.). Crash test dummies are positioned in the buck.

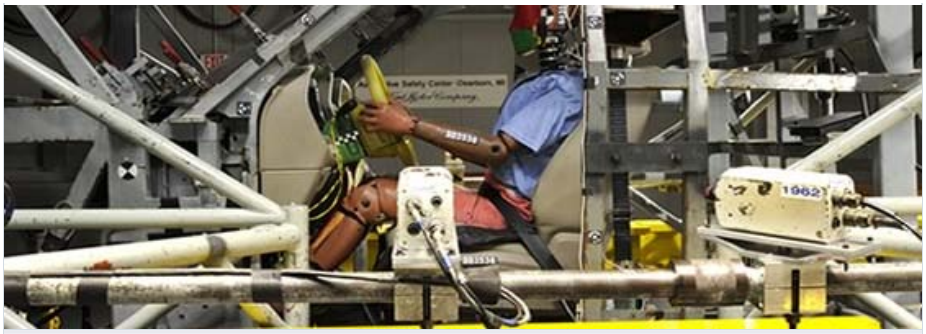
To launch a test, the buck and sled are propelled to more than 35 mph in a few milliseconds. The sled and buck can be used again, but the seats, seat belts, airbags and so forth must be replaced before another test can be performed.

The Servo sled is a significant improvement over the Hyge, for several reasons. Most important, it more accurately represents a vehicle's "pulse," or the acceleration experienced in the occupant compartment during a full vehicle crash test. This reduces the number of full crash tests that must be conducted. The Servo sled can also simulate vehicle pitching and side-impact events, which the Hyge cannot. In short, the new Servo sled allows more representative testing in a given time period, with fewer resources than previously, and enables Ford to more quickly bring safety features to market.

RELATED LINKS

External Web Sites:

National Highway Traffic Safety Administration



Servo-Hydraulic Reverse Crash Simulator, known as the Servo sled

# Collaborative Efforts



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Ford Motor Company is involved with a number of partners to enhance the safety of the driving experience and develop future technologies.



## European Field Operational Test on Active Safety Systems

One of the biggest issues regarding advanced safety systems is real-world user behavior. In 2008, to gain greater insight on this topic, Ford launched a major European research project to deliver a large-scale field operational test on active safety systems. Under the EU's Seventh Framework Program (FP7) for research and technological development, this project joins together 28 partners – including vehicle manufacturers, suppliers, universities and research centers – and will run for three years. More than 1,500 cars and trucks will be equipped with a range of new active safety technologies, along with advanced data collection capabilities. This will allow a thorough evaluation of the new technologies, in real-world scenarios and with ordinary drivers. The project is led by the Ford research center in Aachen, Germany, and includes 100 Ford and 100 Volvo vehicles.

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## CAMP

In 1995, Ford and General Motors launched the Crash Avoidance Metrics Partnership (CAMP) to conduct pre-competitive active safety research with other OEMs, suppliers and the U.S. government. Within CAMP, the Vehicle Safety Communications Two (VSC-2) Consortium, which includes Ford, GM, Toyota, DaimlerChrysler and Honda, is working with the U.S. Department of Transportation on two major projects to develop safety applications that utilize vehicle communications. Their efforts are focused on developing a communication system whereby vehicles can "talk" to each other and to the roadway. This would be analogous to a wireless internet system or a cellular telephone for cars. CAMP VSC-2 successfully completed a project that demonstrated the basic feasibility of this technology, and is evaluating the following applications in a follow-on project:

- **Cooperative Intersection Collision Avoidance System: Violation Warning**
  As a vehicle approaches a traffic light, it would receive a message from the traffic light with the signal phase (red, yellow or green) and the amount of time until the signal changes. The vehicle would use this information, together with the vehicle position and speed, to decide if a warning or some other countermeasure (such as brake assist) is appropriate. The systems engineering and system design were completed, and a prototype vehicle was developed. This prototype was used to successfully complete a pilot field operational test of the system.
- **Vehicle-to-Vehicle Communications for Safety Applications, such as Electronic Emergency Brake Lights (EEBL)**
  The vehicle manufacturers in the VSC-2 are working together with the National Highway Traffic Safety Administration to investigate the messages needed for a host of vehicle-to-vehicle safety applications, including EEBL. For example, when a driver applies the brakes, the brake lights are illuminated, but there is currently no way to distinguish hard braking from light or moderate braking. Further, often only the vehicle directly behind the braking vehicle is able to see the brake lights. If a vehicle performing hard braking could send a message to other vehicles, then those vehicles could warn their drivers, activate brake assist or even start automatic braking. Other applications that evolved out of the work on wireless vehicle-to-vehicle technology include active safety systems such as forward collision warning technologies and lane-keeping systems.

RELATED LINKS

External Web Sites:

- European Field Operational Test
- U.S. Department of Transportation
- Advanced Emergency Communications Coalition
- National Highway Traffic Safety Administration
- Alliance of Automobile Manufacturers
- Society of Automotive Engineers
- U.S. Council for Automotive Research
- Global Human Body Modeling Consortium

CAMP consortia are also conducting two additional projects with NHTSA. The Crash Imminent Braking Project (involving Ford, GM, Mercedes, Continental and Delphi) is developing minimum performance requirements and objective test procedures for systems that automatically apply the brakes to avoid crashes or mitigate the severity of a crash. The Advanced Restraint Systems Project (involving Ford, GM and Mercedes) is developing restraint systems that utilize pre-crash and occupant sensing information.

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## The Advanced Emergency Communications Coalition

For the past 10 years, the ComCARE Emergency Response Alliance has served as an important public voice for improving emergency communications. ComCARE encouraged the establishment of wireless communication networks, infrastructure and technologies that enable emergency communications between the motoring public and public safety agencies. Ford has participated on the Board of Directors of ComCARE for most of the past decade and helped to write the Vehicle Emergency Data Set standard proposed by ComCARE in 2002. Late last year, the ComCARE Board voted to reorganize and establish a new organization to continue ComCARE's advocacy. The name selected for the new organization is the Advanced Emergency Communications Coalition, with the mission "to advocate for the adoption and improvement of advanced emergency communications technologies."

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## University Partnerships

Ford Motor Company is increasingly collaborating with university partners on crucial advanced safety technology projects. Ford has major research alliances with the Massachusetts Institute of Technology (MIT), the University of Michigan and Northwestern University and has utilized Ford's global University Research Program (URP) to collaborate with leading researchers at more than 100 universities worldwide. Safety is a central thrust in our collaborative university programs.

Important projects are underway within the Ford–MIT alliance, yielding progress in areas of vehicle autonomy and "active safety" – that is, technology to prevent accidents from occurring, including computer vision, lane keeping, vehicle controls, obstacle detection and avoidance, and accurately assessing the driver's interaction with the vehicle. At the University of Michigan, safety work includes a portfolio of projects on 360° sensing and developing more robust and capable active vehicle control and enhanced collision avoidance systems, utilizing both onboard sensors and offboard information sources.

Ford has an ongoing URP project at Virginia Tech assessing the properties of maternal tissues from pregnant women. This project will enable the improvement of computer models to help gain a better understanding of the injury risk to pregnant women and their unborn babies. Another project at the State University of New York's Downstate Medical Center should yield an improved understanding of human tolerance to pelvis injury, and collaborative work is ongoing with Purdue University investigating enhanced vehicle dynamics and stability control.

As part of its accident research projects in Germany, the UK and Australia, Ford works closely with internationally acknowledged safety experts from the Universities of Hannover, Loughborough, Dresden, Birmingham and Monash.

Collaborative university work catalyzes innovation at Ford by providing access to the leading researchers at the cutting edge of vehicle dynamics and stability control, accident avoidance and driver assist safety technology to name just a few. Ford will continue to integrate these collaborative innovations, driving continuous improvement in real-world safety and sustainability for all Ford Motor Company products.

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## Alcolock Blue Ribbon Panel

Reducing the incidence of impaired driving would go a long way toward improving road traffic safety. In the EU, 25–30 percent of all car accidents involve alcohol. In the U.S., approximately 40 percent of all traffic fatalities are alcohol-related (as defined by NHTSA).

The Automotive Coalition for Traffic Safety formed a Blue Ribbon Panel (BRP) in 2007 for the development of advanced alcohol detection technology, often called "alcolocks." The panel consists of vehicle manufacturers, including Ford, alcohol detection technology suppliers, Mothers Against Drunk Driving, the Insurance Institute for Highway Safety, government representatives and other experts.

The BRP and its research is being funded jointly by NHTSA and the Alliance of Automobile Manufacturers. The purpose of the research is to "...engage major automakers in cooperative research

that advances the state of alcohol detection technology...to promote the standardization of the technology, its widespread deployment, and acceptance by the general public."

Ford continued to participate in the work of the Blue Ribbon Panel through the Alliance during 2008.

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## New Crash-Test Dummies

Crash-test dummies are essential research tools that aid in the development of passive safety technologies, and Ford Motor Company continues to develop, often in partnership with other parties, more advanced test dummies.

From 2005 through 2008, Ford partnered with the Children's Hospital of Philadelphia (CHOP), the University of Virginia, Virginia Tech and the Takata Corporation in a multi-year project to develop a new abdominal insert and sensor for a crash-test dummy representing a six-year-old child. CHOP studies have shown that, in vehicle crashes, significant abdominal injury in four- to eight-year-old children is second in frequency of occurrence only to head and facial injuries. Abdominal injuries often occur when children too young (i.e., the four- to eight-year-old range) utilize adult restraint systems without a booster seat. The abdominal insert and sensor will allow restraint engineers industry-wide to test the potential for abdominal injuries in children and ultimately improve the development of in-vehicle restraint systems for young children. In February 2008, the Society of Automotive Engineers established a task force to perform "round robin" testing of the new dummy component, and the group held its first meeting in June. More than 20 organizations from around the globe have signed up to participate. Tests will be performed by dummy manufacturers, other OEMs and NHTSA's Vehicle Research and Test Center.

In another effort, Ford, GM and DaimlerChrysler have been working together under the auspices of the Occupant Safety Research Partnership (OSRP), a group within the U.S. Council for Automotive Research, to research, develop, test and evaluate advanced crash-test dummies and other pre-competitive safety systems. A number of years ago, the OSRP initiated development of WorldSID, a male side-impact dummy that is recognized as the most advanced crash-test dummy ever created. From 2006 through 2008, the OSRP worked with NHTSA to help them evaluate WorldSID for potential use in the federal government's new side-impact crash-test standard. NHTSA concluded that the "biofidelity" of WorldSID is better than that of the dummy in the current side-impact regulation. WorldSID is the first side-impact dummy with the potential to be commonly used in side-impact regulations around the world.

Ford is also involved in the Global Human Body Modeling Consortium (GHBMC), which holds promise for the future of safety research. Established in 2006 by nine automotive manufacturers (including Ford) and two automotive suppliers, the GHBMC is working to develop next-generation, computer-generated virtual reality models of the human body. These advanced models will help researchers to better predict the effect of trauma resulting from automobile crashes on the human body and enable a variety of virtual crash tests, with the ultimate goal of improving automotive safety globally. The research and development is currently being led by multidisciplinary teams at universities in five countries – the U.S., Canada, France, India and Korea – with the first set of human digital models expected to be completed in 2011. Ford brings much expertise to this effort, having developed its own human body model representing an average-sized male occupant and publishing this work in peer-reviewed journals over the last 15 years. Ford continues to refine its human body model for use in internal research.

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# Data



The data relating to vehicle safety is included in the Society section of this report. Please click here to see the data.

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# Case Studies



## Driver Distraction

Learn about the latest research on driver distraction, and how Ford has taken steps to enhance driving safety for those who use cell phones and other telematics devices while driving.

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## Driving Skills for Life: Asia Pacific Expansion

Read about the 2008 launch of Ford's highly successful Driving Skills for Life program in the Philippines, Vietnam, Thailand and Indonesia.

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# Driver Distraction



Print report
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Over the past two decades, cellular phones have gone from clunky novelties to ubiquitous must-haves. Wireless subscriptions in the United States have grown from about 28 million in 1995 to about 270 million in early 2009 – a whopping 960 percent increase. The public has become accustomed to using cell phones everywhere – at home, on the street, in restaurants, at the office, while shopping, and – of most interest to Ford's safety researchers – while driving. Indeed, studies by the National Highway Traffic Safety Administration indicate that approximately 10 percent of drivers are using their cell phones at any given time.

The ubiquity of cell phones – coupled with the more recent proliferation of portable music players in vehicles – has heightened concerns about driver distraction. We at Ford agree that this is an important safety issue, and we have taken steps to address it. We also believe that continued research is needed to better understand the complex interactions involved in this issue, and we are participating in that research.

Ford Focus with SYNC®, Ford's fully integrated, voice-activated in-car communications and entertainment system

Recently, the National Safety Council (NSC) called for a total ban on the use of cell phones, both hand-held and hands-free, while driving. The NSC stated that cell phone use while driving is "...a very high-risk behavior with significant impact on crashes...." And indeed, some studies have concluded that there's no difference in driver behavior whether using hand-held or hands-free phones. In many of those laboratory studies, participants in simulated driving situations were observed while being asked to engage in in-depth conversations on challenging or emotional subjects, such as the latest political scandal or a near-death experience. Such intense and lengthy discussions can indeed be distracting.

Naturalistic driving studies – in which study participants' driving performance, "eye glance behavior," driving environment and in-vehicle activities are observed and recorded over weeks or months in real-world situations – have revealed different results. For example, naturalistic studies completed by the University of Michigan Transportation Research Institute are beginning to reveal that, when immersed in real traffic conditions, drivers using cell phones by and large exhibit prudent driving behavior.

In addition, recent results from the landmark Virginia Tech 100-Car Naturalistic Driving Study found that visual distraction, not cognitive distraction, is the main safety concern in the real world. This large-scale study reported that almost 80 percent of all crashes and 65 percent of all near-crashes involved the driver looking away from the forward roadway just prior to the onset of the incident. In 2008, the study's authors summarized their findings in this way: "...it is a rare case that a crash occurs while the driver's eyes are on the forward roadway, regardless of any other 'cognitive demand' that they might be engaged in."

Beyond this, there exists a considerable body of published research that clearly indicates the superiority of hands-free voice interfaces as compared to hand-held or visual–manual interfaces for the same tasks of command or data entry. These studies show advantages in driver performance, eye glance behavior toward the roadway, and object and event detection when the driver can keep eyes on the road and hands on the wheel.

It is also interesting to note that, despite the significant increase in cell phone use in recent years, crash

RELATED LINKS

In This Report:
- Human Behavior

External Web Sites:
- National Highway Traffic Safety Administration
- National Safety Council
- University of Michigan Transportation Research Institute
- Insurance Institute for Highway Safety
- Alliance of Automobile Manufacturers

rates have fallen over the same time period (specifically, in both the categories of "fatal crashes" and "police-reported crashes"). Also, the Insurance Institute for Highway Safety has published studies indicating that hand-held phone bans in New York, Washington, DC, and Finland led to an initial decline in the banned behavior followed by a return to pre-ban levels of hand-held phone use within roughly one year.

For several years now, Ford has been focused on this issue of driver distraction and taken steps to enhance driving safety for those who use cell phones and other telematics devices while driving. Through its work with the Alliance of Automobile Manufacturers, for example, Ford helped lead the development of an industry-wide Driver Distraction Voluntary Agreement, and Ford designs its telematics systems to meet that agreement.

In addition, Ford designed and introduced SYNC®, our voice-activated in-car connectivity system, which has been shown to significantly enhance the ability of drivers to attend to the driving task while using cell phones and music players. Recently completed simulator research at Ford has shown that SYNC substantially reduces drivers' eyes-off-road time and improves lane-keeping, speed maintenance, and object and event detection response times, when compared to hand-held devices for the same tasks. (See the above video for an example. It shows how long it takes a driver to find a song on an MP3 player manually vs. using SYNC's voice-activated system.) This study evaluated driver performance, not driver behavior in the real world. However, these performance effects are consistent with the 100-Car study results and strongly suggest that SYNC will improve highway safety overall.

Ford recognizes that drivers will in fact use cell phones and music players while driving, and that evolving technologies like text messaging are growing increasingly popular. Text messaging is a particular concern, as it requires significant time looking away from the roadway to operate. Ford's SYNC system addresses this concern as well: when a text message arrives, it does not display that message but instead reads it aloud through text-to-speech technology, and then provides a list of canned replies for the driver to select rather than key-in or compose manually.

We believe that further education is needed to help drivers understand the importance of focusing on the driving task and keeping their hands on the wheel and eyes on the road. Ford plans to continue to work with the government and other safety-related groups to discuss measures that can effectively reduce driver distraction and improve driving safety. We also plan to participate in continued research that can further our understanding of safe driving and help spread the message of safe driving.

# Driving Skills for Life: Asia Pacific Expansion



Print report
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In the developing countries of Southeast Asia, traffic safety is a critical and growing concern. Indonesia alone recorded 24 million road traffic accidents in 2007, for example, resulting in nearly 37,000 deaths and more than 2.5 million injuries. The causes behind these terrible statistics are many, and include poorly maintained roads, inadequate infrastructure and the vast number of pedestrians, bicycles and motor scooters that often share roadways with cars and trucks.


Driving Skills for Life

The solutions to this complex issue will also need to be wide-ranging. Among them, however, is better driver education, and that's where Ford has recently stepped up its role.

This past year, Ford's Asia Pacific and Africa region implemented the Company's highly successful Driving Skills for Life (DSFL) driver education program in the Philippines, Vietnam, Thailand and Indonesia. The DSFL program was customized to address the higher average age of beginning drivers in the region, as well as the unique driving environments within each market.

"This is a huge step in the right direction," said Greig Craft, president of the Asia Injury Prevention Foundation (AIPF). "In developing countries, motorization is happening so quickly that road traffic injuries and deaths have reached an epidemic proportion. People are taking to the road in ever-greater numbers, usually without the training to drive properly or the fundamental understanding of driving skills. Driver training, education and public awareness are imperative to making a difference. That's what Driving Skills for Life is all about."

To help bolster DSFL's visibility and credibility to the relevant audiences, Ford is partnering with the AIPF to implement the program. The AIPF is highly regarded for its work with governments to improve road safety in developing markets. In each country, Ford has also secured the endorsement and support of relevant third-party organizations.

Ford launched DSFL in Asia with a "train-the-trainers" workshop in Bangkok, Thailand, in March 2008, at which Ford professionals from Germany trained two to three representatives from each of the four markets. A press conference and drive training for the media were held in each country to launch the program, followed by a series of events in each market for selected groups and members of the general public that included both classroom instruction and drive training sessions.

To date, more than 5,000 people have participated in the training sessions, including nearly 700 in Vietnam, over 1,000 in Thailand and more than 500 in Indonesia. The Philippines accounts for the remainder. Ford Philippines already had a UN-recognized and award-winning road safety program in place called R.I.D.E., or Responsibility in Driver Education, which conducts training sessions in schools and communities. In 2008, Ford Philippines integrated DSFL concepts into 28 R.I.D.E. sessions in 18 schools, reaching 3,000 students. In 2009, Ford Philippines will re-brand and re-launch its road safety programs under the DSFL name, to provide local market clarity and fully align with the regional DSFL program.

The Asia DSFL program covers both safe driving and "eco-driving." The safe driving portion focuses on the use of safety belts, recognizing and anticipating changing traffic conditions, avoiding distraction and maintaining a safe distance from other vehicles in traffic. The eco-driving training includes

RELATED LINKS

On Ford.com:

Ford Motor Company Fund and Community Services

External Web Sites:

Driving Skills for Life

Asia Injury Prevention Foundation

anticipating road conditions, applying fuel-efficient driving techniques, avoiding speeding and keeping a vehicle properly maintained for optimal fuel economy.

The DSFL program aims to involve Ford dealers in each market, helping to raise their profile as responsible businesses that actively contribute to the community. Dealer participation also helps significantly with logistics, as they are able to supply vehicles for the training and often a venue for driving instruction.

In 2009, Ford plans to continue building on the momentum of the DSFL campaign in its Asian markets, with the official launch of programs in China, Taiwan and India. Sessions will continue in the Philippines, Indonesia and Vietnam and Thailand. The 2009 program will also include an online presence which will be directly linked to the U.S. DSFL site. This will significantly extend the reach of the program within each Asian market by allowing an infinite number of people to participate online in local languages.

A grant from the Ford Motor Company Fund and Community Services' Ford GlobalGiving Campaign helped launch the Driving Skills for Life program in Southeast Asia last year, and additional funding will help support the expansion into the three new markets in 2009. This is the first Asian initiative supported by the Fund.

"It is great to see Ford, a leader in safety, doing something about this critical issue," said the AIPF's Craft. "We believe [DSFL] will be the catalyst for further action to improve road safety as nations across this region deal with rapid changes on their roads."

# Sustaining Ford



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During 2008 we:
- Implemented our "One Ford" plan
- Reduced salaried and hourly payroll

The year 2008 undeniably ranks among the most difficult in Ford's history. It was a year marked by workforce reductions, plant closures, dramatically reduced consumer demand for vehicles and the worst global economic downturn in decades. Despite a profitable first quarter, the financial crisis and related credit crunch acutely affected our worldwide operations and challenged all of our stakeholders, including our employees, shareholders, suppliers, dealers and the communities in which we operate.

As the financial crisis deepened around the globe, reduced credit availability, escalating fuel costs and weakened consumer confidence coalesced, resulting in a drastic decline in vehicle sales across the industry – the lowest annualized level in a quarter century. Ford lined up credit before the crisis hit, but the pressures of the recession pushed many in our industry to a critical point.

In the late fall, chief executives from Ford, General Motors and Chrysler appeared before the U.S. Congress to warn about the risks to the industry from the global recession and to ask for help for the industry. Although Ford did not request government funding for restructuring – asking instead for access to up to $9 billion in potential credit – our appearance before lawmakers highlighted the interdependence of an industry that has 80 percent overlap in supplier networks. Nearly 25 percent of Ford's top dealers also own GM and Chrysler franchises, and an uncontrolled bankruptcy of one or both of our domestic competitors, or one of our major suppliers, could also threaten our own operations.

On the supply side, we have been working extremely hard to strengthen our U.S.-located supply base, instituting practices designed to increase collaboration, provide for data transparency and expand the volume of business with select suppliers – all with an eye toward building a more sustainable business model.

(Find our full submission to Congress on our Web site.)

In the past, we allowed our portfolio to become too dependent on popular and profitable trucks and SUVs, missing opportunities to advance production of small- and midsize cars. We fully appreciate that the industry needs to develop greener, safer and even better quality vehicles.

At Ford, sustainability is not an after-thought, and our path toward long-term viability began well before the recent economic downturn began. Over the past several years, we have undertaken a fundamental restructuring in the way that we operate, a reshaping that affects every part of our business, from product innovation and fuel efficiency to labor relations and our interactions with suppliers and dealers. In difficult economic times, it is more important than ever for Ford to stay focused on issues of sustainability.

In short, Ford recognized that our business model needed to change, and we are changing it.

We already have taken many of the decisive actions necessary to ensure a healthy future for our company, including shifting our emphasis away from trucks and SUVs to a more balanced portfolio that includes more small and midsize vehicles. We also have set a $CO_2$-reduction goal for our products, and we are on track to meet it. Our blueprint for sustainability, which highlights how we will meet our product $CO_2$ goal and which we shared with Congress, has positioned us to lead in the industry by delivering the vehicles consumers want and need in the 21st century.

PERSPECTIVES ON SUSTAINABILITY

Lewis Booth

Executive Vice President and Chief Financial Officer, Ford Motor Company

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In This Report:

Handling Downsizing Responsibly

Delivering Products Customers Want

At the same time, we have been working to lower our operational costs. Our transformation plan, which we call "One Ford," was launched in 2007 to create a leaner, more efficient global enterprise and is anchored by four key priorities:

- Aggressive restructuring to operate profitably at current demand and changing model mix
- Accelerated development of new products our customers want and value
- Financing the plan and improving our balance sheet
- Working together effectively as one team to leverage our global assets

As part of this plan, we completed debt restructuring initiatives in the spring of 2009 that will reduce our automotive debt by $9.9 billion and lower our annual cash interest expense by more than $500 million, based on current interest rates. This decisive action will help us weather the economic downturn to deliver long-term profitable growth.

While the economic crisis clearly has taken center stage for governments and policymakers around the world, developing thoughtful and comprehensive energy and climate policies can help secure economic prosperity and provide opportunities for businesses to succeed. We believe that organizations whose recovery plans include ways to reduce greenhouse gas emissions are better positioned for the eventual recovery.

Over the last year, wildly fluctuating oil prices that peaked at $147 per barrel in mid-2008 continued to feed consumer interest in automobiles that are thrifty in their gasoline use, and renewed calls for technologies that will reduce oil dependency. And in rapidly growing economies, the interrelated issues of congestion, pollution and inadequate infrastructure pose additional challenges for the automotive market.

Offering vehicles with smaller environmental footprints, tackling the mobility challenges of rapidly growing urban centers, and tailoring our products and services to increasingly diverse global markets are not peripheral to Ford's future success – they are a prerequisite to it.

# Segment Shifts



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Historically, Ford has operated as four largely separate automotive companies around the globe – North America, South America, Europe and Asia Pacific – each with its own product development systems, manufacturing processes, suppliers and other duplicative structures. While this made sense in the past, in recent years the structure led to unnecessary and inefficient processes and a failure to realize the substantial benefits of scale available to a global enterprise like ours.

As we expanded our brand portfolio around the world, our global enterprise became more difficult to manage and we neglected to ensure that the Ford brand retained its strength in all markets and in all segments. The situation was especially acute in the United States where, in the 1990s, both Ford and our foreign and domestic competitors became increasingly dependent on sales of trucks and large SUVs.

Our focus on these vehicles left us exposed in the event of a market shift to smaller, more fuel-efficient vehicles. We did, in fact, begin to refocus our North American portfolio earlier in this decade with a new line of midsize cars. When fuel prices shot up rapidly in early 2008, however, consumer preferences shifted toward small cars at a much faster pace than we and others in the industry anticipated.

As part of our plan to return to profitability, we are working to reverse the decades-long trend of losing money on the production of small cars in the United States. We are increasing production of smaller-sized vehicles in North America and globally, and we are improving costs to competitive levels. The strong start of the new Ford Fiesta in markets from Europe to Africa to Asia is proof of the progress we are making in this area. We are also enhancing revenues by making vehicles with class-leading fuel economy, safety performance, quality and technology.

We are realigning our new product development and manufacturing capacity to develop a more balanced portfolio of vehicles, including more profitable and desirable small cars.

# Sales Trends



While the overall sales trends for 2008 were gloomy, the progress we showed in the fourth quarter boosted our confidence that we are on the right path. In Europe, for example, we improved our fourth-quarter and full-year market share in the 19 markets that we track, becoming the No. 2 selling brand in Europe.

And in the United States, Ford, Lincoln and Mercury increased overall and retail market share in the last quarter of 2008 and first quarter of 2009 – the first time the brands have posted two consecutive quarters of market share improvements in years.

Based on end-of-year projections, we expect that our overall and our North American automotive business pre-tax results will break even or be profitable in 2011, excluding any special items.

More and more, consumers are also recognizing Ford vehicles for their quality and performance. The 2008 model year marked our fourth consecutive year of improved vehicle quality among noted third-party rating organizations. (See the Economy section for more on quality issues.)

There's no denying, however, that the economic environment will continue to impact global sales in 2009 and beyond. Vehicle demand has fallen so far, and in such a short period of time, that all manufacturers are reducing output, staffing and costs. In particular, industry sales volume in the U.S. and in the 19 European markets that we track declined suddenly and substantially in 2008 and continued at historically low levels into 2009. For full-year 2008, industry demand for cars and trucks in the United States fell to 13.5 million units, compared with 16.5 million units in 2007; in the 19 European markets, demand fell to 16.6 million units from 18.1 million in 2007.

To help boost consumers' buying confidence, we announced a sales incentive plan in March 2009 that includes guaranteed payment protection – up to $700 a month for a full year – for customers in the U.S. who lose their jobs after purchasing a new Ford, Lincoln or Mercury vehicle. The Ford Advantage Plan program was set to run from March 31 through June 1.

For more information on our restructuring and response to the recession, please see the Economy section of this report.

# North American Restructuring



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We continue to make the tough decisions necessary to lower production to match our production capacity to demand for new vehicles. Over the last three years, Ford has significantly reduced employment levels in our North America business unit, lowering payroll from 135,700 individuals at the end of 2005 to about 75,200 individuals at the end of 2008. (These figures do not include dealership personnel.) We reduced U.S. salaried personnel costs by about another 10 percent in early 2009, cut contract personnel by 50 percent over the last three years and offered another round of buyouts to United Auto Workers (UAW) in the spring of 2009.

The majority of the personnel reductions over the last three years were the result of early retirement offers or separation packages to U.S. employees, including Ford employees at our Automotive Components Holding (ACH) plants. However, in order to reduce operating costs even further, we took the difficult but necessary step of involuntary separations among salaried workers.

Although we achieved our previously announced goal to operate with between 55,000 and 60,000 hourly non-ACH employees in North America by the end of 2008, we embarked on additional personnel reduction actions last year to achieve even lower hourly employment levels and better match our vehicle assembly operations to consumer demand. By the end of 2008, our hourly non-ACH workforce totalled 49,600.

Since 2005 we have closed 12 manufacturing facilities in North America (including ACH facilities), and we have announced four additional plant closures slated to take effect between 2009 and 2011. Two of these planned facility closures involve ACH facilities, with one ACH plant closing in 2009 and another in 2011. We are exploring our options for the four remaining ACH plants and intend to transition these businesses to the supply base as soon as practicable.

We have attempted to handle workforce separations and plant closings with respect for the people and communities affected. For example, we have offered UAW-represented employees a selection of voluntary separation packages, including traditional offers of early retirement as well as innovative programs designed to help employees transition to new jobs requiring new skills. Other actions we took to handle downsizing and facility closures responsibly are detailed in the Economy section of this report.

In February 2009, our two top executives, Bill Ford and Alan Mulally, voluntarily agreed to accept a 30 percent reduction in salary for 2009 and 2010. As previously announced, Mr. Ford has requested that his total compensation be set aside, to be paid only at a point when the company's global automotive operations have returned to profitability. In addition, our Board of Directors has voluntarily agreed to forgo all cash compensation for 2009.

We took a number of additional steps to reduce salaried personnel costs, including:

- Eliminating 2009 merit pay increases and performance bonuses
- Suspending 401(k) matches, tuition assistance and dependent scholarships
- Capping retiree life insurance at $25,000
- Increasing employee cost sharing in benefit programs

# Focusing on Labor Costs



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**$500 million**
Amount Ford expects to save per year based on modifications to our UAW contracts.

As part of our aggressive restructuring efforts, we have focused not only on the labor costs of our workforce, but on the related costs of providing comprehensive health care benefits to nearly 500,000 current and retired employees, including their dependents, in the United States alone. Previous contracts with the UAW provided lifetime health care benefits for UAW members and their surviving spouses.

Rising costs of health care coverage, coupled with our high proportion of retirees, have put us at a competitive disadvantage, compared with more recent entrants to the U.S. auto market. Our health care costs have been estimated to add about $1,000 to the cost of each vehicle built in the United States.

Over the last two years, we have worked with our UAW partners to help us reach parity with foreign-owned auto manufacturers. The agreements we have reached – including mid-contract modifications that were ratified by the union in March of 2009 – are critical to our efforts to operate through the current economic environment, without accessing a bridge loan from the U.S. government.

In our 2007 contract with the UAW, we agreed to help ensure health care coverage for current and future retirees by shifting $13.2 billion in cash and stock into an independent trust called the Voluntary Employee Beneficiary Association, or VEBA. In the first quarter of 2009, the UAW approved a revised plan that allows Ford to pay up to half our VEBA contributions in stock, rather than cash, enabling greater flexibility when each trust payment is due. The restructuring of VEBA financing will allow us to be more competitive with foreign automakers' U.S. manufacturing operations. These modifications are subject to a number of conditions as described in the Economy section of this report.

We estimate that the modifications from the contract agreement will save Ford $500 million a year – and possibly even more over time – through the VEBA restructuring and other savings that were approved by the union members, such as reductions in paid break time for factory line workers and increased use of alternative work schedules. The UAW also agreed to:

- Suspend Cost of Living Allowance, or COLA, increases for the remainder of the contract, which expires in 2011.
- Suspend lump sum performance bonus payments of 4 percent and 3 percent of base earnings in 2009 and 2010, respectively.
- Suspend $600 Christmas bonus payments and discontinue the "Easter Monday" paid holiday for the remainder of the operating agreement.

The union also ratified incentives for employee participation in a wellness program, which would include regular physicals and other steps to improve individual health.

Implementing these changes will reduce average hourly wages for approximately 42,000 Ford UAW workers from approximately $60 an hour to $55 an hour, which is nearing parity with the average wage for foreign-based competitors in the United States. We believe that the average hourly rates will become even more competitive with foreign-based automakers in coming years.

The modified contract also eliminates the "jobs bank" for laid-off union workers, which had allowed hourly employees to receive almost 100 percent of their salaries and benefits until they received another job offer from Ford. The new agreement will pay laid-off employees a reduced salary until another job offer is received and for a set number of weeks, based on seniority. The employees would forfeit the benefit if they turn down another job offer from Ford.

# 2008 Sales and Highlights



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| Business Unit | 2008 Wholesales (in thousands) | Percent Change from 2007 | Highlights |
|---|---|---|---|
| Ford North America | 2,329 | -19% [1] | ■ Ford, Lincoln and Mercury collectively increased U.S. overall and retail market share in the last three months of 2008 – the first time the brands posted three consecutive months of market share improvements in 12 years.<br>■ The 2009 Ford F-150, introduced in the fourth quarter, was named Motor Trend magazine's "Truck of the Year" and was awarded the title of "North American Truck of the Year" at the North American International Auto Show in January 2009.<br>■ The F-Series pickup truck has been the best-selling truck in the United States for 32 straight years.<br>■ Ford has the highest number of vehicles rated "Top Safety Picks" by the U.S.-based Insurance Institute for Highway Safety.<br>■ We began production in fourth quarter 2008 of the 2010 Ford Fusion, Mercury Milan and Lincoln MKZ sedans, as well as the Fusion and Milan hybrids. The latter two vehicles are the most fuel-efficient midsize sedans in the United States.<br>■ We began implementing EcoBoost™ in 2009 – an engine technology that will deliver up to 20 percent better fuel economy and up to 15 percent fewer $CO_2$ emissions compared to larger displacement engines. |
| Ford Europe | 1,820 | -5% | ■ We improved fourth-quarter and full-year market share in the 19 markets we track, becoming the No. 2 selling brand in Europe.<br>■ Fiesta, named "Car of the Year" by What Car? Magazine, was the United Kingdom's best-selling model in November and December 2008, and 2009 will mark the Fiesta's first full sales year. The Fiesta sold more than 110,000 vehicles between its European debut in the fall of 2008 and early March 2009.<br>■ The new Ford Ka reached full production in Europe. |
| Volvo | 359 | -26% | ■ Volvo launched the XC60 crossover in Europe in 2008 and in the U.S. in spring 2009. Volvo will introduce low-emission versions of seven cars in 2009, as well as a freshened S80, Volvo's flagship sedan. |
| Jaguar, Land Rover, Aston Martin | 125 | -57% | ■ Ford sold Jaguar and Land Rover effective June 2, 2008. Ford sold Aston Martin in 2007. |
| Ford South America | 435 | -1% [2] | ■ In 2009, the European-based Ford Focus comes to Brazil, Argentina and Venezuela.<br>■ Also coming to Brazil are the North American-based Ford Edge and the European-based Transit.<br>■ Four additional product actions are planned for introduction in the region in 2009.<br>■ Ford is investing $1.1 billion in our Brazil operations in the next four years and another $215 million in our Argentina operations from 2009 to 2012. |
| Ford Asia Pacific Africa | 464 | -13% | ■ In 2009, the new Ford Fiesta five-door and four-door sedans, built in Nanjing, were introduced in China.<br>■ In 2008, we launched a freshened Ford Focus in China and the Ford Escape in key Asia Pacific and Africa markets.<br>■ Ford is investing $500 million to expand our manufacturing facility in Chennai, India, to begin production of a new small car and to build a fully integrated and flexible engine manufacturing plant planned to begin production by 2010.<br>■ The Fiesta is also being introduced in 2009 in Australia and New Zealand, where the FG Falcon XT was named "Best Large Car" in the 2008 Australia's Best Cars Awards.<br>■ The Falcon G6E Turbo won Carguide's "Car of the Year" honor, as well as its "People's Choice Award."<br>■ |

Other product introductions in 2009 include the new Ranger compact pickup and the Everest SUV, both with advanced, efficient TDCi turbo-diesel engines.

## Notes

1. In the first quarter of 2008, Ford changed the reporting structure for the North America segment to include the sale of Mazda6 vehicles by our consolidated subsidiary, AutoAlliance International, Inc. (previously included in the results for Mazda). As a result, prior period information, including 2007 wholesales, was reclassified.
2. Company cars for South America were not included in the wholesales that were reported in the 2007 Form 10-K. For the 2008 Form 10-K, we made the change to both the 2008 and 2007 wholesale numbers.

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Executive Vice President and Chief Financial Officer
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## Ford Motor Company

### Executive Vice President and Chief Financial Officer

As a global company, Ford is subject to a range of economic cycles as they occur in different regions of the world. One unusual aspect of the current financial crisis is that it is affecting large parts of the global economy at the same time. This means that many areas of our own business are under pressure as key world markets struggle with falling consumer demand and other recessionary trends.

At times like this, it is important that we do not lose sight of creating a sustainable company that balances the needs of our business and society. For example, when oil prices fall, as they did in the second half of 2008, we must not be lulled into complacency. Our assumption is that the dip in oil prices is almost certainly temporary. We expect the price of energy to rise over time as economies around the world recover and consumers once again begin buying new cars and trucks.

Our product decisions reflect that thinking, and reinforce the essential link between a financially sustainable company and a sustainable environment. We must find ways to develop the vehicles that consumers want and value while at the same time build products that burn less fossil fuel and reduce $CO_2$ emissions.

We believe the best way to make a difference is to focus on solutions that reach not just hundreds or thousands of cars, but millions of vehicles. Our commitment is to be the best, or among the very best, on fuel economy with each new vehicle we introduce.

Furthermore, we are convinced that electrification is a significant part of the solution, and we're moving quickly to bring electric vehicles to market.

At the same time, we have sharpened our focus on shifting customer trends. In the 1990s and early this decade, Ford in North America put significant resources into producing full-size pickup trucks and SUVs. Our investments in generating cars that people would want and value trailed that of trucks and SUVs. While the move made business sense at the time, we were not as prepared for a change in customer trends as we might otherwise have been.

Customers want cars that deliver as much fun, emotion and value as their trucks and SUVs do. We are making substantial progress toward creating an exciting, profitable passenger car line, but we have undoubtedly been hampered by the continued slowdown in demand for new vehicles. Are we progressing fast enough? We're all impatient, so it's never fast enough.

But we can point to solid progress constructing a balanced portfolio of products that includes cars, crossovers, utilities, pickup trucks and commercial vehicles. We also are well into the process of realigning our manufacturing system so that we have the flexibility to match production capacity to market demand as it evolves.

A business that is less reliant on revenues from full-size pickup trucks and SUVs must find new ways to generate better profits from the rest of our product range. As such, under the banner of One Ford, we continue to improve how our product development, purchasing, marketing and manufacturing operations work together globally and more efficiently.

Our cars and trucks now and in the future will stand for safety, fuel economy, high quality and cutting-edge technology. This strategy puts us on the path for operating as a lean, global company that satisfies customers and makes a solid return – one that allows us to protect our shareholders and employees, as well as the interests of our suppliers and dealers.

I know we can produce cars that delight people around the world and meet society's expectations for sustainability. That's what Ford has been in the past, and that's what Ford will be in the future.

Lewis Booth

Executive Vice President and Chief Financial Officer, Ford Motor Company

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## Sustainable Design & Manufacturing Program, Manufacturing Research Center, Georgia Institute of Technology

### Professor of Mechanical Engineering and Associate Program Director

The notion of sustainable mobility is rapidly evolving. When we were growing up, most people in developed nations aspired to own their own cars. That's not necessarily the case any more, particularly in densely populated areas. City dwellers need a broad range of options to get from point A to point B without having to operate a vehicle themselves.

The challenge is finding ways to blend advanced technologies with transportation services. There must be a significant "cool" factor that makes people want to change their driving behaviors to reduce congestion and vehicle emissions. Georgia Tech and Ford are working together to redefine sustainable mobility and transportation in cutting-edge ways.

For example, we have been developing touch-screen kiosks, powered by solar energy, and mobile phone applications that will put transportation information at people's fingertips, allowing them to see at the touch of a button locations and departure schedules for the nearest trains, buses, shuttles or taxi services.

We initially began working with Ford on just one project, helping to maximize efficiencies on a particular plant assembly line. Our relationship has grown, and over the last six years our projects have identified potential cost savings for Ford of more than $4 million per year, in addition to environmental and social benefits.

Our partnership with Ford really lends credibility to our own program. All too often, people think of "sustainability" and they think you're a tree-hugger. When you have a name like Ford associated with your program, there's recognition that we must be providing value. Sustainability is not just about saving the planet; it's about saving companies, too. If you have a company that goes bankrupt, that's not sustainable for anyone involved.

We're very excited about our latest project with Ford, which examines mobility options and transportation alternatives in urban "mega-cities." We're looking at transportation issues from all sides of the equation – engineering, computer science, business, industrial design, marketing and branding. Congestion, air quality and population growth are the trends that are driving sustainable mobility – and they are relevant whether you're in Bangalore or in New York City. The difference is that in the developing cities you don't have the infrastructure and you typically don't have the means to buy a car.

Locally, we're working to improve transportation options in and around our own campus through such simple things as bike share programs and shuttle buses that connect to Atlanta city buses. It makes sense to focus first on large metropolitan areas, like Atlanta, where transportation systems are already in place. Ideally, one would want to develop and apply new modes of transportation in large cities, and then connect outward to smaller, surrounding communities.

When evaluating new transportation ideas, one must consider not only the potential benefits but also any potential unintended consequences. For example, the Dutch conducted an energy consumption study after promoting energy-efficient light bulbs, but did not see the energy savings they expected. The reason? People left the lights burning longer because the new bulbs were cheaper to operate, so they were back to square one.

The same theory applies to mobility issues: we want to make sure there's no rebound effect. Widespread transportation changes need to be efficient, cost effective and convenient or they're not going to catch on.

**Bert Bras**
Professor of Mechanical Engineering

**Tina Guldberg**
Associate Program Director

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## Gerald R. Ford School of Public Policy and Department of Sociology, University of Michigan

### Ph.D. Candidate, Public Policy and Sociology

Sustainability and governance are very broad terms. At a minimum, sustainability encompasses a firm's long-term environmental, social and financial performance, while governance is an umbrella term for the processes and structures a company uses to address these sustainability dimensions. Historically, many companies viewed these three areas separately and managed them in isolated silos. This trend has been shifting dramatically over the past several years, however, as more firms have begun identifying connections between environmental and financial performance.

Institutional investors have been a driving force behind this change. A broad range of shareholders – including faith-based investors, public pension funds, foundations, unions and SRI firms – have united on climate change and other corporate governance issues tied to sustainability. Through organizations like Ceres' Investor Network on Climate Risk (INCR) and the Interfaith Center on Corporate Responsibility (ICCR), these investors are pushing U.S. firms to disclose their business risks to climate change and voluntarily adopt greenhouse gas emission (GHG) reduction targets in anticipation of government regulation of GHGs.

Some companies, including Ford, view these shareholders as a source of expertise and seek out their advice on complex environmental and social governance issues. To better understand this phenomenon, I conducted an academic case study on Ford's shareholder engagement with the Sisters of St. Dominic, an order of Dominican nuns in New Jersey. Together with other ICCR and INCR investors, the Sisters have been filing climate change resolutions at the company since 1991. In particular, Sister Patricia Daly, or "Sister Pat," is a well-known shareholder activist described by some at Ford – only half in jest – as part of the management team.

After two years of dialogue with the Sisters and the State of Connecticut Retirement Funds, the shareholders withdrew their climate change resolution after the Company agreed to publish its goal to reduce $CO_2$ emissions from its products in this report. I interviewed Ford managers and the investors to study this relationship and its broader applications for good governance. Ford managers viewed the Sisters as long-term investors who want not just environmental sustainability for the planet but financial sustainability for the Company as well. The relationship between the Company and the nuns is one infused with trust. Both Ford and the Sisters said they are committed to the relationship they have built over nearly two decades.

The relationship goes both ways; Ford has also earned the trust of Sister Pat by demonstrating a willingness to share information with her and other responsible shareholders on issues of climate risk. The case demonstrated an attitude of openness toward shareholders and stakeholders at the Company, as well as an interest among managers in gaining exposure to outside perspectives on sustainability issues.

In Ford's case, responsible investors are viewed as trusted intermediaries who can lend legitimacy to a company's emerging business strategies and communicate information about new initiatives to other activist groups. Both the Company and responsible investors view continued engagement as a win-win situation as Ford moves forward with its sustainability strategies.

Melissa Forbes

Ph.D. Candidate, Public Policy and Sociology, Gerald R. Ford School of Public Policy and Department of Sociology, University of Michigan

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## Environmentalist, entrepreneur, journalist, author

We could debate how quickly or slowly climate change is occurring, but since no one knows for sure, it's a useless exercise. We will know the rate of change in hindsight, but that should not prevent us from taking action now.

It's the uncertainty over the rate of change that creates a rationale for inaction among some. I interpret it the other way around. Uncertainty calls for action precisely because of what we don't know. Some scientists tell us that a permissible limit for $CO_2$ is 450 parts per million (ppm); others say it is 350ppm. Since we're already at 387, the mandate is clear. This is a physics and engineering problem that is solvable – but not if we dither.

The pluses for addressing climate change are huge, and the minuses are almost negligible. Tackling climate change addresses energy security, creates jobs and cultivates rapid innovation in technology.

The biggest obstacle to addressing climate change is ignorance. Many people simply don't understand the data, the science and the related implications. Climate change has been gamed by the media in such a way as to introduce doubt where there is none. This is not an environmental issue. It is a civilizational issue, and the first truly global one in the history of humankind.

This general lack of understanding creates problems for companies that are working to adapt their products and confront the issue. To whom will they sell? To the 80 percent that don't understand the problem or to the 20 percent that are concerned and want to do something about it? Companies need 100 percent of sales, not 20 percent, so the dilemma is obvious.

The question for a large company like Ford is, how quickly can it adapt to changing environmental and market conditions so it can outmaneuver competitors, but without penalizing its capital costs? This is a period in which business destinies will be made or broken. Historically, companies have resisted change in favor of the status quo. I think you can say, with all due respect, that Detroit had been stuck in the past for quite a while. So what is the auto industry going to do going forward now that the status quo has been pulled out from underneath them?

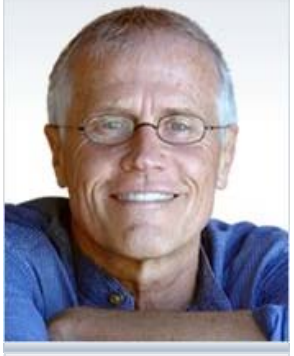
It takes years for a new automobile design to reach consumers. Ford has been reducing the cycle time to become more adaptive and using global platforms to create a more resilient, flexible system. Those who foment and demand efficiency changes in the American automobile fleet want it yesterday, which is understandable. But we're still talking about iron here – and that has its own rate of transformation.

You can't sell cars that people won't buy, even if they're better for the environment. There remains a significant gap between the harmonization of what's good for us, and what a consumer can or will actually purchase. Ford has to manage its product timeline so they're not reacting after the fact to shifts in customer demand. Conversely, we all know that if you get too far ahead of the curve, you fall off. How do you engineer the car for the future if the future is changing faster than ever? This is not an easy task.

Ford, which has really exciting products in the pipeline, has a challenge and an opportunity in the way it communicates with the public. For example, I don't think it's well understood that Ford's new Fusion hybrid is the best midsize hybrid in the market. That's a big deal.

Ford Motor Co. started with a communitarian sense when it began in 1903. I believe Ford needs to communicate the idea that they are making changes to their automobiles so that society and humanity can continue to evolve and grow. That may be an aspirational vision, but it's a pressing need in the face of climate change.

I have said in the past that if you look at climate change data, and you're optimistic, then you're not understanding the data. However, if you look at people who are working to address the future and you're not optimistic, then you don't have a pulse. It's Dickensian in that way – being the best and worst of times. The best is what many people are doing now and the worst is the legacy of what we've done to our planet out of ignorance.



Paul Hawken

Environmentalist, entrepreneur, journalist, author

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## President, Insurance Institute for Highway Safety and the Highway Loss Data Institute

The Insurance Institute for Highway Safety plays a direct and an indirect role in the sustainability of motor vehicle transportation. To be sustainable, we must continue to make motor vehicle transportation even safer than it is today. That's our direct role. Our indirect role focuses on the intersection of safety with related issues, such as a greener environment through increased fuel economy.

Over the last five to 10 years, vehicle manufacturers have become drivers of safety improvements. For example, auto manufacturers have developed new safety features, such as electronic stability control, and installed them in vehicles without any mandates from federal regulators. Electronic stability control is clearly a huge benefit and every customer should look to purchase this feature when buying a new vehicle.

Vehicle manufacturers and suppliers are leading the curve with new technologies like blind spot warning, lane departure warning, and forward collision detection and warning. It used to be that groups like ours had to advocate for the development of new safety technologies. Now, we're trying to keep up with vehicle manufacturers to determine which ones really do work and to understand how drivers are responding to them. For example, will electronic lane departure warnings work as well as the rumble strips that we have in roadways? Or will drivers turn them off?

The Institute, the auto industry and government must work together to help ensure that motor vehicle safety and the environment achieve a proper balance. We all want safer motor vehicle transportation and a greener environment. We should achieve increased fuel economy through a variety of technologies, such as hybrid-electric vehicles, and not just by reducing vehicle weight, which can increase safety risks.

We have achieved so much over the last decade that it may seem like we have done all we can for safety. Yet, each year, 40,000 people are killed in motor vehicle crashes in the United States. We must not lose sight of that fact. As vehicles themselves have become safer, the environment has grown riskier. Drivers are traveling faster, while cell phones and other gadgets have added to the list of potential driver distractions.

Although the fatality count has stayed within the same range for a number of years, we have seen significant improvement when that rate is normalized per miles driven. Our studies have shown that the fatality rate would have gone up over the past decade if vehicles had not been getting progressively more protective of their occupants. This means that the operating environment has been getting riskier, but better designed motor vehicles more than compensate for those increased risks.

Presumably, vehicles will continue to improve, especially as we learn which crash prevention technologies really work. But as a society, we must also focus on improving the operating environment for drivers, by enforcing speed limits or redesigning intersections. Replacing stoplights with roundabouts, for example, can virtually eliminate serious injuries in side impact crashes.

Ford has a lot to be proud of in its safety history. The Ford Taurus was one of the first vehicles to perform well when our institute introduced frontal offset crash tests in 1995. Ford also helped to focus automakers on driver side airbags and was the first to include a noticeable seat belt use reminder in U.S. vehicles – without a federal requirement. We shouldn't be surprised that Ford, along with Volvo, was the leader among manufacturers in our latest round of Top Safety Picks.

We all know there's still much to be learned and more to do where safety is concerned, but things are definitely moving in the right direction.

Dr. Adrian K. Lund

President, Insurance Institute for Highway Safety and the Highway Loss Data Institute

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## Office of International Labor Affairs and Corporate Social Responsibility, Bureau of Democracy, Human Rights and Labor, U.S. Department of State

### Acting Director

Protection of labor rights is a fundamental human right. In 2007, our office added Corporate Social Responsibility to our title to reflect the essential role that companies can play in promoting human rights, which is a longstanding goal of U.S. foreign policy.

We make the argument that effective CSR policies are good for business in terms of worker retention, morale, productivity and risk mitigation. Even when times are challenging, it makes sense to continue to have effective CSR policies. At the same time, one must recognize that the current global economic crisis will present many new challenges, particularly for suppliers facing price pressures.

We concentrate primarily on the labor aspects of human rights, and CSR is a key tool in our efforts. Much of our focus is on eradicating labor abuses within international supply chains, whether in pig iron from Brazil, cotton from Uzbekistan or cocoa from West Africa.

In the auto industry, the complexity of the supply chain is mind-boggling, with thousands of suppliers spread out across the globe. Each product has its own challenges, particularly in remote regions where there are multiple layers of suppliers. Charcoal sourced from the Brazilian Amazon that may be tainted with forced labor, for example, is used in the making of some pig iron, which, in turn, is used to make steel, which is then turned into auto parts.

There are a tremendous number of hurdles for companies with vast supply chains – not only in controlling the conditions within the product chains, but even in simply getting a handle on what might be going on, particularly in areas where labor rights violations are hard to detect.

Ultimately, the responsibility for enforcement lies with governments. But in many cases, countries must contend with underfunded labor ministries and factories that are practically unreachable or hidden in the informal sector. In Brazil, it can take days for inspectors to travel by truck to the charcoal camps where forced labor might be alleged.

Ford's leadership within the Automotive Industry Action Group has been essential in bringing automakers together to focus more clearly on CSR policies and social goals. Ford has also been part of multi-stakeholder dialogues that include companies, governments and NGOs. These dialogues are critical to our understanding of the issues and to determining what role each of us can play.

One of the trends we're seeing is a shift from focusing solely on monitoring of supply chains to focusing more on remediation and training. The monitoring model in and of itself may not be entirely effective. Companies need to know their suppliers, they need to know the suppliers of their suppliers, and they need to do the types of training that Ford has been doing within its supply chain in order to reach the lowest rung of suppliers.

Individual companies can absolutely have a real impact by monitoring working conditions, providing livelihoods for individuals and offering models for others. Despite the economic climate, we remain optimistic that efforts to improve working and social conditions will continue to receive greater focus internationally.

**Mark Mittelhauser**

Acting Director, Office of International Labor Affairs and Corporate Social Responsibility, Bureau of Democracy, Human Rights and Labor, U.S. Department of State

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## Ford Motor Company

### Director, Sustainable Business Strategies

In 2007, Ford took a big step forward on the climate change front, developing a goal to reduce vehicle $CO_2$ emissions by 30 percent by 2020. We are executing to that plan, delivering vehicles to the market that have best-in-class fuel economy. In fact, we have really accelerated our efforts by announcing, for example, our plan to deliver a battery-powered van in 2010, a battery electric small car in 2011 and a fleet of plug-in hybrids in 2012.

Bottom line: we will see some overachievement and some underachievement each year as we work toward our 30 percent reduction goal. But without a doubt, we're on the path to get there.

The fact that we already had a sustainability plan really helped us last year when the auto companies went before Congress. We didn't have to create a plan to give to lawmakers – we already had our blueprint for sustainability to prove how we are moving forward. The blueprint had many of the elements Congress was looking for to respond to climate change, including more fuel-efficient vehicles and better technologies.

Companies like Ford can play an active role in developing climate change-related public policies. Our vehicle emission goals are consistent with the aggressive $CO_2$ reduction targets that were outlined by the U.S. Climate Action Partnership. We're participating actively in the Partnership and in other efforts around the world.

For example, in a move to reduce $CO_2$ emissions, some European countries created voucher incentive programs to encourage people to trade in their older vehicles. A similar program in the U.S. could have a significant impact on climate change by replacing less-efficient vehicles with newer models that are equipped with much cleaner technologies. As this report was published, such proposals are being considered for the U.S. At the same time, such programs would also boost auto sales and help our industry. In Germany, car sales jumped to their highest level in 10 years in February 2009, thanks to the program.

In a bad economic environment, it's even more important for Ford to stay focused on issues of sustainability because they directly impact our bottom line. For starters, market conditions convinced us to produce more fuel-efficient vehicles, and new regulatory requirements will penalize us if we fail to meet new standards. Moreover, customers continue to indicate that fuel economy is a reason to buy a new vehicle, even when gasoline prices are low. Clearly, we need to push the sustainability agenda when developing new products to make them more attractive to consumers.

A few years ago, Ford was looking equally at electrification and hydrogen fuel cells as possible replacements for petroleum in the long term. But over the last year, we made the decision to concentrate our efforts on electrification. Given our difficult economic situation, we had to prioritize one area for our vehicle technology focus. Electricity won out in part because of the infrastructure advantages over hydrogen.

Of course, the climate change debate isn't just about vehicle technology; it's also about fuels and how much people drive. A company like ours can't make much of an impact on the fuels themselves, but we can help reduce the number of miles driven by engaging with governments and others to improve transportation options in and around cities.

John Viera

Director, Sustainable Business Strategies, Ford Motor Company

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