



The EU and the Automobile

Countering the Economic Downturn, Revitalizing the Industry

“The year 2009 will be very difficult for the car industry. However, I am convinced that by acting together in a coordinated manner, we will be able to emerge from the current crisis stronger and with an automotive industry which is well-placed to take advantage of the promising long-term perspectives in the global vehicle market.”

— European Commission
Vice-President
Günter Verheugen,
responsible for enterprise
and industry

Although cars are ubiquitous today, the technology that is so pivotal to the modern life of Americans and Europeans is relatively young. The introduction of the gasoline-fueled internal combustion engine dates back only to 1885. By 1888, Karl Benz, a German engineer and the inventor of the modern automobile, had launched the first line of mass-produced cars in Germany. The U.S., France and then Britain soon followed suit.

Just over a century later, the plight of the automotive industry during the recession has become a clear example of how integrated the world's economies and industries have become. Europe and the United States are each working diligently to ensure the continued viability of the industry. If their efforts are rewarded, the outcome may be an innovative and revitalized auto industry that has incorporated efficient and environmentally sustainable technologies into its products, and created new jobs in the process.

In the EU, the primary responsibility for dealing with the crisis lies with the auto industry itself, but complementary European and national measures can help mitigate the impact of the downturn and create the necessary framework for the industry to successfully compete and thrive in open market conditions. EU leadership in setting and adhering to global automotive standards also facilitates trade and production worldwide.

Although changes in automotive technology were already underway, the economic crisis will accelerate the process. The EU is driving forward greener vehicles through measures like its Green Cars Initiative and European Clean Transport Facility. EU legislation mandating improved fuel economy in new passenger cars will reduce the amount of greenhouse gas emissions produced by automobiles. The EU also supports the development of alternative fuels, and EU funding for automotive research and development should lead to cleaner, safer, and smarter vehicles.



EU Automotive Statistics

- For more than a decade, annual auto sales in the EU fluctuated within a relatively narrow margin—16.7 to 17.7 million. *IHS Global Insight*
- Production in the EU accounts for 27 percent of worldwide vehicle (cars, buses, trucks) manufacture and assembly. *IHS Global Insight*
- European new passenger car registrations fell by 7.8 percent to 14.7 million units in 2008, recording the sharpest decline since 1993. *European Association of Automobile Manufacturers (ACEA)*
- In 2007, passenger car production accounted for 86.7 percent of total EU motor vehicle production. *ACEA*
- In 2008, the EU exported approximately €71 billion and imported about €30.5 in passenger vehicles, registering a trade surplus of more than €40 billion. *DG Trade*
- In 2008, the EU had a €14.7 billion surplus in trade in passenger vehicles with the United States, with exports to the U.S. of €20.7 billion and imports from the U.S. of €6 billion. *DG Trade*

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Europe's Automotive Sector

Working toward Economic Recovery

Assistance to Ford Motor Company in Spain Authorized

In mid-June, the European Commission approved significant government support by the Spanish government to Ford España in Spain's Valencia region. The €51.9 million package will support the dismantling of existing production lines and the installation of equipment for the manufacture of three new passenger car models. The project should guarantee the continuity of plant operations, maintain 5,000 jobs, and contribute significantly to the region's economy without distorting competition.

"We are talking about millions of jobs, not only in the automotive sector, but in the supply chain and in the aftermarket. We are committed to defend these jobs, because the European automotive industry is the most competitive and innovative industry in the world."

– European Commission
Vice-President
Günter Verheugen,
responsible for enterprise
and industry policy

As the world's largest producer of motor vehicles, the EU's flagship automobile industry is a key driver of growth, exports, innovation, and jobs.

With an annual turnover of around €780 billion, the EU auto sector plays a pivotal role in Europe's economic prosperity, and manufactures more than 18 million motor vehicles a year. According to recent figures, the EU automotive sector enjoys a trade surplus of €60 billion, with exports amounting to €125 billion.

Auto companies directly employ more than two million workers and support an estimated 12 million additional jobs, including those in the automotive supply chain. The industry represents 6.5 percent of the EU's manufacturing sector and invests more than €20 billion per year in research and development, making it the EU's largest private investor in research and development.

Automotive manufacturing is closely linked with other sectors—key suppliers include electronics, mechanical and electrical engineering, information technology, steel, chemicals, plastics, metals, and rubber. One-fifth of the EU's steel and more than a third of its aluminum production go into automobile production. Typically, 50 European suppliers are involved in the production of a new car, generating around 75 percent of the vehicle's added value.

Because of the interdependence of the automotive supply chain, any downturn in the auto sector creates a serious ripple effect throughout the EU economy. The European Parliament commissioned a recent study by Global Insight, a Paris-based research institute, on the impact of the current economic crisis on the auto sector. According to the analysis, the economic recession and financial crisis are having a devastating effect on the automotive industry, with serious implications for the wider economy. Global Insight characterizes the current crisis as threefold in nature:

- Access to credit is drastically limited and even when credit is available, the cost is high for vehicle manufacturers, their suppliers, and potential buyers.
- Demand has dropped dramatically for both passenger cars and commercial vehicles.

- The industry operates with low margins due to its complex and diverse product portfolio. There is mounting pressure to adapt manufacturing, logistics, vehicles, and R&D to meet stricter environmental standards.

Manufacturers have called on EU governments and institutions to help preserve a healthy and strong automotive industry in Europe. As the economic downturn worsened in 2008, the EU acted to support auto industry efforts to withstand the crisis, soften negative impacts, and ensure long-term competitiveness. Building on the European Economic Recovery Plan (EERP) of 2008, the EU proposed an array of measures to improve credit access, clarify rules for granting government support in particular circumstances, boost new vehicle demand through coordinated national action, minimize social costs, retain the skilled workforce, ensure fair competition in open markets, and restore confidence.

The EU ensures that national decisions fit well with its overall vision for the industry, and makes certain that government support and other measures are well-directed and working to build the industry's future strength, rather than introducing short-term distortions that will harm long-term competitiveness.

The EU is also helping to stabilize the industry through programs that encourage investment in strategic technologies, retrain and reassign workers whose jobs are at risk, and safeguard and develop the skills of some of Europe's most valuable technicians. Intelligent application of EU and national policies should cushion the auto industry during stressful times, and be a springboard for a dynamic, competitive, and sustainable future.

The auto industry will benefit from tailored EERP provisions to get credit moving again, measures supporting "green cars," and efforts to boost demand, save jobs, and spur smart investment:

- Government support is an important tool for promoting innovation, environmental objectives, and restructuring of benefit to the automotive industry. Traditional EU rules on government support are structured to maintain a level, competitive playing field; to prevent any distortion of competition by favoring particular companies or sectors; to offer Member States a wide range of possibilities to financially support companies, regions, workers, and the unemployed; and to stimulate demand.



- The Temporary Framework for State Aid introduces greater flexibility to the rules and allows EU Member State governments to provide support to companies (whose difficulties do not pre-date the crisis) experiencing liquidity problems. The framework facilitates access to credit for car manufacturers and parts suppliers. It also encourages automakers to invest in green vehicles, typically through offering subsidized loans and guarantees for the production of environmentally sustainable products.
- The European Green Cars Initiative is a public-private research partnership covering a broad range of technologies and smart energy infrastructures essential to achieving a breakthrough in the use of renewable and non-polluting energy sources, safety, and traffic flow.
- The European Commission, the EU's executive arm, coordinates national "scrapping" measures to boost new vehicle demand by offering financial incentives to consumers who replace an older car with a newer, more efficient model.
- Falling production levels and subsequent cost-cutting by automotive firms have led to serious job losses. The EU is committed to countering this trend by creating new jobs and promoting mobility; upgrading skills and matching labor market needs; and increasing access to employment. Working with its Member States and social partners such as trade unions and employers' organizations, the EU is pursuing concrete actions to stem unemployment and train skilled workers in the increasingly demanding technological skills required by the auto industry.
- The European Social Fund (ESF), established by the EU's founding treaty in 1958, is a proven tool for creating jobs and combating unemployment. The ESF helps workers upgrade and adapt their skills, improving their job prospects. In order to build momentum for economic recovery as quickly as possible, the ESF has adapted its practices and requirements by reducing administrative burdens, making funds available sooner, and being more flexible with Member States in the co-funding of programs.

- The European Globalization Adjustment Fund (EGF), introduced in 2007, can be tapped to help workers whose jobs are lost as a result of globalization. The EGF funds labor market measures that include support for job hunting, career guidance, tailored training and certification, outplacement assistance, and programs that promote entrepreneurship or aid self-employment. Auto workers in several Member States have already benefited from EGF-funded actions to return them to the workplace following plant closures.

"Governments have a responsibility to address the short-term problems in this sector, while preparing the sector—and the economy as a whole—for long-term recovery. We need to strengthen both the production and the sale of cars within the single market, and what we have set out ... will help governments take the right measures to do just that."

— EU Competition
Commissioner Neelie Kroes

European Auto Manufacturers Providing U.S. Jobs

The automobile industry clearly illustrates 21st century globalization and the interdependence of the world's industries. For years, U.S. automakers, including General Motors and Ford, have had a strong manufacturing presence in Europe. Current U.S. plans for reviving and restructuring the U.S. auto industry include further linkages, such as the Chrysler-Fiat alliance whereby Fiat will provide Chrysler with the platform for building smaller, more fuel-efficient vehicles in the U.S. and access to Fiat's global distribution network.

European auto manufacturers are also present in the United States, investing in communities and providing American workers with jobs.

The **BMW** plant located near Spartanburg, SC, began producing cars for the global market in 1994. Today, the Spartanburg plant operates six days per week, employs around 4,200 people, and manufactures more than 170,000 vehicles per year.

Mercedes-Benz opened its plant in 1997 in Tuscaloosa, Ala., and produced its one millionth vehicle ten years later. Today, the plant has two assembly lines, employs 3,782 workers and has an annual vehicle production capacity of 160,000, including an award-winning SUV produced exclusively in Alabama for worldwide distribution.

Volkswagen is constructing a new manufacturing plant in Chattanooga, Tenn., with production slated to begin in 2011. Volkswagen Group of America will invest \$1 billion in environmentally-friendly buildings that will house a body shop, paint shop, assembly line, and offices. The new plant will employ 2,000 workers. Nearly a third of the new mid-sized sedans that will be produced specifically for the North American market will be powered by Volkswagen's TDI Clean Diesel Technology.

Going Green

Moving Toward More Sustainable Transport

“By reducing CO₂ emissions emitted by new cars sold in the EU, the recently adopted CO₂ and cars regulation will not only contribute to our efforts to tackle climate change, but will also foster the global competitiveness of EU carmakers by placing them at the forefront of fuel efficiency developments, and deliver substantial fuel savings for consumers.”

— Stavros Dimas,
EU Environment Commissioner

Fuel Economy and CO₂ Emissions around the World

According to the Pew Center on Global Climate Change, the European Union and Japan have the most stringent standards for fleet-average fuel economy, and the United States and Canada have the least stringent standards. Because CO₂ emissions correlate directly with fuel economy, the United States and Canada also have the highest new car CO₂ emissions levels, and the EU and Japan have the lowest.

Diminishing oil reserves and escalating global demand have combined to increase the volatility of fuel prices. The EU's transportation sector is 98 percent dependent on fossil fuels and is currently responsible for approximately 21 percent of the EU's harmful greenhouse gas (GHG) emissions, with more than half of those emissions produced by passenger cars.

Technological progress is transforming the automotive industry from a traditional manufacturing-based sector into an increasingly knowledge-based one. The opening of global markets and the increase and diversity in the movement of capital worldwide are altering the environment in which the automotive industry operates.

Combined, these circumstances have created a situation where the EU's automotive industry faces new dilemmas, responsibilities, and opportunities. To address these challenges, the European Union is taking concrete action to help fight climate change, reduce fuel costs, and increase European competitiveness.

EU regulations will further reduce the amount of GHG emissions produced by automobiles by mandating better fuel economy in new passenger cars, and vehicle manufacturers have responded by developing new models that are cleaner and more fuel efficient. The EU also supports the development of alternative fuels, including sustainable biofuels.

Fuel Economy and CO₂ Emissions

The current average fuel economy for U.S. domestic passenger cars is 27.5 mpg. In spring 2009, the Obama Administration proposed an average federal fuel economy standard for U.S. automobiles of 35.5 mpg, to be phased in between 2010 and 2016. EU targets are even more ambitious.

In April 2009, a new EU regulation went into effect requiring that average carbon dioxide emissions from new passenger cars be reduced to 130 grams per kilometer (g CO₂/km). The legislation is the cornerstone of the EU's integrated approach to reducing CO₂ from light-duty vehicles to 120 g CO₂/km by 2012. (130 g/km equates to 44 mpg, 120 g/km to 47 mpg, and 95 g/km to 59 mpg). The 130 g/km target will be phased in from 2012 to 2015, with the

remaining 10 g CO₂/km reductions delivered through complementary measures to improve the efficiency of car components, including tires and air conditioning systems.

These EU-wide fuel economy targets for new passenger cars provide manufacturers with more planning certainty and flexibility to meet CO₂ reduction requirements than would be the case with separate national reduction objectives.

The new legislation is key to the EU's internal effort to reduce overall CO₂ emissions by 20 percent by 2020, and represents a major step in lowering CO₂ emissions from transport. It will also ensure that the EU remains a world leader in fuel-efficient cars by reducing the average emissions of CO₂ from new passenger cars by 19 percent in 2012–2015, from around 160 g CO₂/km to 130 g CO₂/km.

The regulation sets an even more ambitious target of 95 g CO₂/km by 2020 for the new car fleet, underlining the EU's determination to deliver on its greenhouse gas commitments under the Kyoto Protocol and beyond. It will not only reap environmental benefits, but will also result in fuel savings for consumers, promote eco-innovations, and support the creation of new high-quality jobs in the EU.

Lowering Allowable Levels of Additional Emissions Pollutants

In addition to CO₂ limits, EU legislation also limits emissions of additional pollutants from “light motor vehicles,” including passenger cars. EU-wide requirements cover emissions of carbon monoxide (CO), non-methane hydrocarbons (NMHC) and total hydrocarbons, nitrogen oxides (NOx) and particulates (PM). The legislation sets standards known as Euro 5 and Euro 6 that apply to tailpipe emissions, evaporative emissions, and crankcase emissions. Limits are set according to category of pollutant and type of vehicle.

Euro 5, applicable from September 2009 onward, reduces particulate emissions from diesel cars from 25mg/km to 5mg/km. Euro 6 is scheduled to apply from January 2014, and will reduce nitrogen oxide emissions from diesel cars from 180mg/km to 80mg/km.





Andris Piebalgs, EU Energy Commissioner, tests out an electric car.

Fueling Greener Driving

The EU strongly supports the development of alternative energy sources for transport to reduce greenhouse gas emissions, diversify energy supply sources, and develop long-term replacements for fossil fuel. The EU's drive to achieve a 20 percent share of renewable energy by 2020 includes a 10 percent target for renewables in transport.

Processed from biomass, a renewable resource, biofuels are a direct substitute for traditional gasoline and diesel and can readily be integrated into existing fuel supply systems. Although most biofuels are still more costly to produce than fossil fuels, their use is increasing. Thanks to policies that encourage biofuels production, global production of biofuels now exceeds more than 35 billion liters (9.25 billion gallons). Further developments may lead to lower environmental impacts and lower production costs.

In December 2008, the EU adopted two pieces of legislation (the Renewable Energy Directive and the Fuel Quality Directive) that establish minimum sustainability criteria for biofuels. They also set minimum greenhouse gas savings requirements and create an obligation on fuel suppliers to progressively reduce the lifecycle greenhouse gas intensity of energy used for road transport (a Low Carbon Fuel Standard) by six percent by 2020, a level that may be increased to 10 percent. These measures encourage the development of better biofuels with higher greenhouse gas savings and lower adverse environmental impacts.

Projects co-funded by the European Commission's Intelligent Energy-Europe Program (IEE) aim to increase the production and use of alternative

fuels by improving their economic competitiveness and minimizing their environmental impacts. Transferring best practice in the use of biofuels—a key component of IEE-funded projects—helps ensure that regions where markets are less developed benefit from the experience of those which are further down the path. IEE biofuels projects also develop business opportunities in agricultural communities, promote contacts between different actors, and offer training to professionals, farmers, technicians, and craftsmen.

European Green Cars Initiative

As part of its European Economic Recovery program, the European Commission has launched the European Green Cars Initiative to promote research across the technologies and smart energy infrastructures that will be essential for a breakthrough in the use of renewable and non-polluting energy sources.

Funded jointly by the EU, industry, and Member States, the public-private initiative will have a combined budget of at least €5 billion. The European Investment Bank (EIB) will provide loans to car manufacturers and suppliers to support industrial innovation, especially those technologies designed to improve the environmental and safety performance of cars. The EU's Framework Program for Research and Technological Development (FP7) will offer grants for research on the greening of road transport, with a €1 billion budget funded equally by the European Commission and the transport industry.

The European Green Cars Initiative complements the EIB's European Clean Transport Facility, which serves to provide more immediate financial relief to the sector.

EIB Loans for Cleaner Motor Vehicles

Since December 2008, the EIB has approved more than €5.2 billion in loans for European car and truck makers. Two-thirds of the funding supports the EIB's European Clean Transport Facility (ECTF), which specifically targets significant reductions in vehicle emissions of CO₂ through research, development, and innovation, as well as the production of cleaner and more fuel-efficient cars and other transport.

The European Investment Bank was created in 1958 by the Treaty of Rome to contribute to the integration, balanced development, and economic and social cohesion of the EU Member States. The EIB raises substantial volumes of funds on the capital markets, which it lends to projects furthering EU policy objectives, such as clean car technology.

Promoting Green Vehicles through Public Procurement

A new EU directive promotes clean and energy-efficient vehicles by requiring the mandatory inclusion of lifetime costs for energy consumption, CO₂ emissions, and pollutant emissions as award criteria in the procurement of vehicles for public transport services.

Green vehicles initially have a higher price than their conventional counterparts. This legislation aims to stimulate demand for low energy, low emission vehicles and to create economies of scale that will lead to cost reductions and the further development of green transport.

“Caring about the European car industry means caring about millions of present and future jobs in the EU. It also means caring about clean and affordable cars to respond to the right to mobility in an environmental friendly way.”

—European Commission Vice-President Günter Verheugen, responsible for enterprise and industrial policy

Streamlining the EU's Regulatory Requirements

EU-U.S. Transatlantic Regulatory Environment

The EU and the U.S. National Highway Safety Administration (NHTSA) have concluded a Memorandum of Cooperation in the Field of Motor Vehicle Regulations aimed at bolstering the partners' joint commitment to improve vehicle safety and fuel economy and to assist the harmonization efforts underway under the 1998 UNECE Global Agreement.

“Replacing EU law with UNECE rules reduces red tape and industry can adapt faster to technical developments. The UN Agreement has been increasingly relevant as we have been moving to a global world. This is a model for successful international collaboration which needs to be copied by other industrial sectors.”

– European Commission Vice-President Günter Verheugen, responsible for enterprise and industry.

The automotive industry is one of the most regulated sectors in the EU due to the complexity of its products and the rules governing vehicle use. Detailed technical requirements help set common industry rules and standards that help ensure a level playing field and fair market conditions in the EU and abroad.

EU Type Approval. Before a motor vehicle can be registered and sold in the EU, it must comply with the Framework Directive for Whole Vehicle Type Approval. The directive replaces national procedures with a single EU approval process and simplifies EU rules, prescribing specific safety and fuel economy tests and containing a long list of technical requirements to which vehicles must conform. It also deals with individual components and the separate sub-assemblies from which vehicles are manufactured.

The directive makes a number of road safety devices compulsory, including anti-lock brakes, new and more effective front and rear-view mirrors, improved lights, side protection to prevent cyclists from being dragged beneath vehicles, and anti-road spray devices. Requirements also apply to CO₂ emissions, fuel consumption, engine power, and smoke from diesel engines.

UNECE Standards. Common standards and regulations are essential to the worldwide competitiveness of the European automobile sector. They bring certainty to manufacturers, allowing them to plan and develop products for international markets in the long term, and they reduce costs, improve economies of scale, and boost export opportunities.

Harmonization also benefits the environment and improves vehicle safety. Technologies that cut emissions and bring safer vehicles to roads can be introduced more rapidly and more cost-effectively if regulations are applied globally and test criteria agreed internationally.

Europe has been at the forefront of international harmonization efforts since the 1958 Agreement of the United Nations Economic Commission for Europe (UNECE) on technical standards for motor vehicles. The subsequent 1998 UNECE Global Agreement opened up the development of common technical standards for motor vehicles with countries that are not contracting parties to the original 1958 agreement—including the United States, China,

and India—and further strengthened international harmonization. The UNECE Agreement has resulted in more than 126 regulations relating to safety, environmental protection, energy efficiency, and anti-theft performance of motor vehicles.

The more the EU regulates at UNECE level, the better it is for European industry. In addition to avoiding divergent laws and administrative duplication, one single UN-level standard also contributes to simplifying EU legislation. The Whole Vehicle Type Approval Directive introduced the mandatory application in the EU of UNECE regulations, replacing 38 EU directives. The close links between EU and UNECE rules enable a European vehicle that is approved on the basis of UNECE requirements to be accepted by many other countries.

CARS 21

The High-Level Group on a Competitive Automotive Regulatory System for the 21st Century (CARS 21) was established in April 2005 to chart the way toward the sustainable development of a competitive European automotive industry. The group's membership is drawn from Member State representatives, European Commission officials, Members of the European Parliament, leaders in the automotive industry, and trade union representatives; its mandate includes developing recommendations for a short, medium, and long-term public policy and regulatory framework for the European automotive industry.

Participants at the most recent CARS 21 meeting in late 2008 concluded that the European car industry needed to position itself as a global leader in clean, safe, and affordable vehicles in order to safeguard jobs and effectively combat climate change.

CARS 21 will also launch a task force to promote “green cars,” bringing stakeholders together to explore technical, regulatory, and economic hurdles, and to suggest ways forward for such vehicles. Finally, the 2008 conference underlined that carmakers in the EU need to be able to compete on fair terms in international markets.

Driving Technological Advances, Creating the Car of the Future

Experts forecast rapid changes in technology for the auto industry over the next decade. While the automobile was originally just a “horseless carriage,” today’s cars are increasingly constructed of new materials and sophisticated electronic components. To be competitive, comfortable, safe, and environmentally-friendly, new vehicles must incorporate the latest technologies.

The EU is driving forward its automotive research and development through funding and focused involvement by industry and the research community. Under its Framework Programs for Research and Technological Development (FP), particularly the most recent—FP7—the European Commission is supporting a greener, safer, and smarter pan-European transport system with a research budget of €4.16 billion (2007–2013). A “greener” car fleet brings with it new opportunities for innovative technology, including research projects like the following:

- **NICE**, the New Integrated Combustion System for Future Passenger Car Engines, brings together 25 partners from academia and industry in nine countries to improve vehicle engine fuel consumption and reduce emissions from diesel and gas-fueled engines. The EU is contributing €14.5 million of the total €26.4 million.
- **HI-CEPS** is developing improved engine components for hybrid vehicles that will satisfy the environmental and consumer requirements of the 2010–2012 mass market, and make electrically-assisted internal combustion engines more reliable and efficient, cheaper to build, and better to drive. The partnership consists of car manufacturers and research institutes from 11 countries, along with the European Commission. The EU covers half of the more than €19 million cost.
- **HyICE** projects focus on improving the performance of internal combustion engines that will one day use hydrogen as a fuel. Researchers have already achieved a 15 percent increase in power output. The public-private partnership includes 10 participants from four countries; the EU provides €5 million of the total €7.7 million cost.
- **TYROSAFE** optimizes the interaction between road surfaces and tires to increase safety and reduce CO₂ and noise emissions.

“Fuel Cells and Hydrogen Joint Technology Initiative represents a major milestone in the way the EU conducts target-oriented research by partnering with the industry, which will increase the overall resources available for R&D and will allow for better coordination with National and Regional Programs.”

— Janez Potočnik, EU Commissioner
for Science and Research



European Technology Platforms and Joint Technology Initiatives

The EU’s European Technology Platforms (ETPs) bring together stakeholders from industry, the scientific community, and the European Commission to define research priorities and action plans in specific fields. The ETP on road transport—the European Road Transport Advisory Council—has helped guide the formulation of FP7 priorities for transport research: greening transport, strengthening competitiveness and efficiency, and enhancing mobility and safety. Joint Technology Initiatives (JTIs), an innovation under FP7, bring together EU-funded projects and major industrial stakeholders to move technologies closer to the market.

Fuel Cells and Hydrogen Joint Technology Initiative. An important initiative in green transport research, the Fuel Cells and Hydrogen JTI is an industry-led, public-private partnership jointly funded by the EU and the automotive industry.

Designed to accelerate the development of fuel cells and hydrogen technologies in Europe and make their commercialization possible by 2020, the JTI implements an integrated program of basic and applied R&D activities focused on the most promising applications.

Some protagonists argue that hydrogen, introduced with suitable policy measures, could reduce total oil consumption by the road transport sector by 40 percent

between now and 2050, and halve CO₂ emissions from peak levels by mid-century. Up-front costs would need to be balanced against savings from replacing conventional fuel and vehicles, with a break-even point expected between 2025 and 2035, according to an analysis by HyWAYS, an EU-funded project assessing hydrogen’s potential socio-economic impacts.

HyWAYS estimates that in 2030 there could be 16 million hydrogen cars and €60 billion in total cumulative investment for supporting infrastructure.

Embedded Electronics Systems—Artemis Joint Technology Initiative. In the automotive industry, electronics constitute an increasing proportion of a vehicle’s value, rising from 22 percent in 1997 to between 33 and 40 percent by 2010. An estimated 70 percent of automotive innovations over the last 20 years are electronics-related, and many have had a major impact on automobile safety. For example, vehicles with electronic stability control are 35 percent less likely to be involved in accidents.

The EU established the JTI on Embedded Electronics Systems—Artemis—to promote economies of scale, cost savings, and quicker commercialization of products based on embedded computer technologies. Participants in this public-private partnership will pool funding to co-finance pan-European research initiatives.

Smart Cars Help Reduce Road Fatalities

On the Web

- **EU and Automotive Industry**
<http://ec.europa.eu/enterprise/automotive>
- **Reducing CO₂ emissions**
http://ec.europa.eu/environment/air/transport/co2/co2_home.htm
- **Intelligent Car Initiative (including eSafety)**
http://ec.europa.eu/information_society/activities/intelligentcar
- **EU Transport Research**
<http://ec.europa.eu/research/transport>
- **Embedded Computing JTI**
<https://www.artemis-ju.eu>
- **EU Response to the Financial Crisis**
<http://ec.europa.eu/financial-crisis>

Although casualties from auto accidents may be decreasing, they remain unacceptably high: road accidents kill more than 40,000 people in the EU each year, and injure nearly 2 million more, costing society about €160 billion.

In 2003, as part of its Intelligent Car Initiative, the EU launched eSafety, a public-private sector action to improve road safety through the use of intelligent road safety systems that improve the driver's ability to prevent or better respond to hazards on the road.

Such smart car technology encompasses a wide range of ICT-based systems, some of which are already in use, including anti-lock brake systems and electronic stability control. Some, including the intersection assistant; pedestrian/vulnerable road user protection; and wireless local danger warning; are still in development. Others are being introduced into the market and include:

- **Adaptive cruise control:** Standard cruise control is enhanced by automatically adjusting the vehicle speed and distance to the vehicle ahead, using a long-range radar sensor, a signal processor, and longitudinal vehicle control.
- **Driver drowsiness monitoring and warning:** By tracking the driver's facial features, hand and foot movements, analyzing eye-closures and head pose or even changes in heartbeat, the system can detect the driver's drowsiness and provide an alert.
- **Extended environment information system:** Data from different sources in the vehicle—operating lights and windshield wipers, anti-lock brakes and stability control systems—can be used to provide useful information about the environment in which the vehicle is traveling and provide information about potentially dangerous situations.
- **Lane change assistance/blind spot detection:** When the turn signal is activated, indicating an impending lane change, these systems warn the driver either visually or by vibration of the steering wheel if changing lanes is unsafe.
- **Lane departure warning systems:** Warnings are issued when the vehicle deviates or is about to deviate from the lane when traveling above a certain speed without activating the turn signal.



- **Night vision:** Invisible infrared sensors offer increased nighttime visibility at a range equivalent to high beams, without blinding oncoming traffic. The driver can view a special illuminated display of the scene that shows an improved view of the road ahead, including vehicles and objects in the distance.
- **Tire pressure monitoring system:** Real-time tire pressure is monitored through sensors inside each tire, as well as by individual wheel speeds, and communicated through a gauge or warning light. Properly inflated tires are safer, perform better, and are more fuel efficient.

Research in Smarter, Safer, and Cleaner Vehicles

The EU's Intelligent Car Initiative requires sustained research efforts to meet its long-term objective of smarter, safer, greener road transport. The EU fosters cooperative research in intelligent vehicle systems, helps facilitate the adoption of new technologies, and includes the Initiative's scientific activities as part of FP7.

Specifically, the Intelligent Car Initiative supports the following R&D areas:

- The next generation of driver assistance systems to enhance performance, reliability, and security.
- Integrated systems and applications to facilitate vehicle-to-vehicle and vehicle-to-infrastructure communication.
- Real-time traveler and traffic information and integrated modes of transport.
- Field tests in real-world environments to assess the impact of eSafety systems on driver behavior and driving dynamics.



EU Focus is published bi-monthly by the Delegation of the European Commission to the United States.

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ISSN: 1830-5067
Catalogue No.: IQ-AA-09-05-EN-C

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