Research, innovation and sustainable mobility

Fiat Group is committed to meeting the mobility needs of customers, while reducing the environmental and social impact of vehicles over their entire life cycle.

The Group's global research and innovation activities are focused on developing solutions for increasingly sustainable mobility, by reducing fuel consumption and emissions, improving vehicle recyclability and safety, and developing new models of mobility. Continuous innovation is essential to development of products that are environmentally and socially sustainable, as well as affordable.

Innovating for Sustainable Products and Processes

In 2012, the Group launched the Global Innovation Process (GIP), which establishes a common framework for the coordination of all innovation activities worldwide.

Developed in collaboration with, and on the basis of, input from the Group's four operating regions, the GIP covers all phases of the innovation process, from idea generation to pre-competitive development. As part of that process, guidelines and targets are then formalized in the Strategic Agenda.

The process is coordinated centrally by the Chief Technology Officer who, as a member of the Group Executive Council, ensures alignment of the innovation process with the Group's strategic objectives, as well as synergies and transfer of new solutions across the Group's global product portfolio.

At year-end 2013, the Group's Research and Innovation activities involved some 18,700 individuals at 78 centers worldwide.

During the year, the Group invested approximately €3.4 billion in R&D[(1)], representing around 4% of net revenues from Industrial Activities.

The Group's innovation activities have generated a significant intellectual property portfolio over the years and, at year-end 2013, it had a total of 8,521 registered patents.

Patents – Fiat Group worldwide (no.)	
Patents registered at 31 December 2013	8,521
of which: registered in 2013	425
Patents pending at 31 December 2013	3,333

of which: new patent applications filed in 2013	459

Patents – Fiat Group worldwide (no.)
Patents registered at 31 December 2013
of which: registered in 2013
Patents pending at 31 December 2013
of which: new patent applications filed in 2013

(1) Includes capitalized R&D and R&D charged directly to the income statement.

Centers of Excellence

Centro Ricerche Fiat (CRF), headquartered in Orbassano (Turin, Italy), was established in 1978 as a focal point for Fiat Group's research and innovation activities and it is a recognized center of excellence at the international level. The Center's mission is to continuously improve the Group's competitiveness through the development of innovative solutions, processes and methodologies. All research activities are carried out in coordination with the Group's technical areas and operating regions. CRF draws on technical skills and know-how covering the full spectrum of automotive engineering disciplines and is equipped with state-of-the-art laboratories for testing powertrain systems, analyzing materials and electromagnetic compatibility, and conducting noise and vibration analyses and driving simulations.

The Chrysler Group Automotive Research and Development Centre (ARDC) opened in May 1996 in partnership with the University of Windsor in Canada and serves as an illustration of what can be achieved when industry, academia and government work together. The ARDC is equipped with six road-test simulators and a range of research and development support facilities, including the Automotive Coatings Research Facility, the Automotive Lighting Research Facility and the Vehicle Recycling Laboratory.

Dedication to innovation in numbers (no.)	2013
CFR employees at year end	905
Co-funded research programs, approved under the EU's 7th Framework Program(*)(2007-2013)	174
of which: approved in 2013	23

Dedication to innovation in numbers (no.)
CFR employees at year end
Co-funded research programs, approved under the EU's 7th Framework Program(*)(2007-2013)
of which: approved in 2013

(*) The Framework Programs are funding instruments established by the European Union to support and encourage research and development. Each program is put forward by the European Commission and adopted by the European Council and Parliament. The 7th Framework Program ran from 2007 to 2013.

The Group's product strategy is based on an approach centered on reducing the environmental impact of vehicles over their entire life cycle. Key elements in that strategy include improving the efficiency of conventional engines, offering a full range of alternative fuel vehicles, developing alternative propulsion and emissions reduction systems, reducing the energy requirements of vehicles, promoting driver behavior that contributes to reducing emissions and introducing new mobility services and solutions.

There is no single solution to the challenges faced by the automotive industry. Immediate and tangible results can only be achieved by combining conventional and alternative technologies, while recognizing and accommodating the different economic, geographic and fuel requirements of each market. Affordability is also a key consideration: even the most effective technologies cannot have a significant impact on the environment if they are too expensive to reach a sufficiently large number of people.

The Group's commitment to increasingly sustainable mobility has been demonstrated by the results already achieved in reducing fuel consumption and CO_2 emissions, particularly in EMEA and NAFTA, where approximately 72% of Group revenues were generated in 2013.

In the European Union, the Group's mass-market and premium brands (Fiat, Alfa Romeo, Lancia, Abarth, Chrysler and Jeep) have reduced average CO_2 emissions per vehicle sold by 24% over the past 13 years. In addition, approximately 71% of Group cars sold in 2013 had CO_2 emissions at or below 120 g/km, and 81% at or below 130 g/km.

New registrations by CO_2 emissions level in European Union for Mass-Market and premium brands (g/km)(*)	
up to 100	13%
from 101 to 110	12%
from 111 to 120	46%
from 121 to 130	10%
above 130	19%

New registrations by CO_2 emissions level in European Union for Mass-Market and premium brands (g/km)(*)
up to 100
from 101 to 110
from 111 to 120
from 121 to 130
above 130

(*) CO_2 data based on New European Driving Cycle (NEDC) measurement standard.

In the United States, which accounts for 84% of shipments in the NAFTA market, vehicle efficiency is measured by fuel economy(1) expressed in miles per gallon (mpg). In 2013, Chrysler Group's domestic passenger car mpg increased from 31.1 in 2012 to 32.1, an improvement of 3%. Light truck mpg increased 1%, from 24.3 to 24.5.

This trend of continuing improvements in emissions and fuel economy is the result of strategic choices made by the Group based on a process of continuous innovation.

Following are descriptions of some of the main technological innovations introduced on Group vehicles during 2013.

(1) Data is reported to the U.S. National Highway Traffic Safety Administration (NHTSA) and provided by model year, meaning the year used to designate a discrete vehicle model, irrespective of the calendar year in which the vehicle was actually produced, provided that the production period does not exceed 24 months. CAFE standards from NHTSA are set independently for passenger cars and light duty trucks. Fuel economy is based on the most recent NHTSA required submission, which for 2013 reflects mid-model year data. Previous year data is adjusted to reflect final EPA/NHTSA reports.

Innovative Powertrains

During the year, the Group continued introduction of the award-winning two-cylinder TwinAir engine on models sold in Europe, including the 65 hp naturally-aspirated version, the 85 hp and 105 hp turbo and the 80 hp natural gas turbo. The natural gas version is now available on the Fiat 500L and 500L Living and the 105 hp turbo (introduced on the 500L in 2012) was launched on the Fiat 500 hatchback and convertible, the Fiat Punto and the Alfa Romeo MiTo. All versions of the TwinAir family and the 170 hp FIRE Turbo engine use second generation MultiAir technology (MultiAir II) which, with advanced air intake and combustion management systems, offers significant reductions in CO_2 emissions without compromising performance or drivability. During the year, the Group also completed the process of upgrading all gasoline engines to comply with Euro 6 emissions standards that will apply to all new cars sold in Europe from September 2015.

Chrysler Group's eight-speed rear-wheel-drive automatic transmission is available on the Ram 1500 pickup, Chrysler 300, Lancia Thema, Dodge Durango and Charger, Jeep Grand Cherokee and Grand Cherokee SRT. Depending on the application, this transmission contributes to fuel economy improvements of up to 12%, compared with the previous five-speed and six speed transmissions it replaces. It will ultimately be used on all rear-wheel drive vehicles except for the heavy-duty diesel versions of the Ram truck.

In 2013, a new nine-speed front-wheel-drive transmission was introduced on the 2014 Jeep Cherokee and the recently unveiled 2015 Chrysler 200. In addition to improved fuel economy over a six-speed automatic transmission, the Cherokee's nine-speed transmission delivers a more responsive driving experience, including quicker acceleration and smoother shifting. The Chrysler 200 is the world's first mid-size sedan to feature a nine-speed automatic transmission, which comes standard. When equipped with the available award-winning 3.6L Pentastar V□6 engine, which delivers best-in-class 295 hp, the Chrysler 200 sedan's highway fuel economy is improved by nearly 13% compared with the outgoing model.

Research in gasoline engine technology continued to focus on solutions that optimize performance while reducing emissions. Those solutions leverage the synergies offered by complementary technologies, such as modern turbocharging systems coupled with the performance characteristics of the second-generation MultiAir system and use of exhaust gas recycling systems. The result is increased flexibility in engine management and, as a consequence, the potential for reductions in both fuel consumption and emissions. New transmissions enabling engines to run at lower operating speeds (downspeeding) will lead to further reductions in fuel consumption. This will enhance the competitiveness of the product, by combining improved performance with a reduction in operating costs.

For diesel engines, the MultiJet II with Injection Rate Shaping (IRS) technology was extended to the entire range with the launch of the new 120 hp 1.6L version on the 500L and the new 150 hp 2.0L version on the Alfa Romeo Giulietta. The MultiJet II offers reduced fuel consumption (up to 3% lower) and polluting emissions (as much as 20% lower nitrogen oxide emissions) through the use of advanced combustion control strategies, without sacrificing performance. The MultiJet is the latest evolution of Fiat's revolutionary Common Rail technology and, in 2013, the Group plant in Bielsko Biala, Poland, produced 5 million units of the 1.3-liter version alone.

The Group's recently-launched V-6 EcoDiesel engine benefits from Fiat's MultiJet II technology. The engine was adapted specifically for the North American market to meet stringent emissions and on-board diagnostic regulations. The 3.0L EcoDiesel V-6 engine was named one of Ward's 10 Best Engines for 2014 and contributed to the 2014 Ram 1500 being named Motor Trend Truck of the Year.

Research activities focus on two main areas: continued evolution of the injection and combustion process, aimed at increasing engine output and reducing noise, and the study and development of innovative solutions to reduce polluting emissions, particularly nitrogen oxides, which will be subject to further legislative restrictions in the future.

In the transmissions area, innovation activities primarily focused on evolution of the Dual Clutch systems currently available on the Alfa Romeo MiTo and Giulietta, Dodge Dart and Fiat Viaggio and the Fiat 500L in the U.S. Specific areas of focus included optimization of the mechatronic actuation system and integration with the transmission, as well as refinements to the control system to further enhance handling and fuel efficiency.

For Magneti Marelli, eco-sustainable products[1] contributed €1.41 billion in revenues for 2013, representing an increase of 9.3% over the prior year (€1.29 billion).

[1] Includes Xenon and LED headlights, LED tail lights, GDI injection systems, electronic control modules, automated manual transmissions and dual clutch transmissions.

Alternative Fuels and Propulsion Systems

A key element in Fiat Group's emissions reduction strategy is the use of alternative fuels.

The Group believes that natural gas is currently the most effective and affordable solution available for reducing CO_2 emissions and pollution levels, particularly in urban areas. The level of CO_2 emissions from a car running on natural gas is 23% lower than for an equivalent gasoline-powered vehicle.

In addition, natural gas in the form of biomethane, which is produced from biomass, has significant potential for development as a widely-available renewable energy source.

With a total of 12 natural gas/gasoline models now available, Fiat Group is the first and only automaker to offer a complete range of bi-fuel passenger cars and commercial vehicles. In 2013, the Group launched natural gas versions of the Fiat 500L and 500L Living with the new 80 hp Natural Power TwinAir Turbo engine, which was

awarded “Best Green Engine of the Year 2013”, one of the 12 categories in the prestigious “International Engine of the Year Awards”.

The Group also continued as the undisputed leader in this market sector in Europe with over 62,000 natural gas vehicles sold in 2013 (+15% versus 2012).

In 2013, Chrysler Group remained the only automaker in North America to offer a factory-built natural gas pickup, the Ram 2500 Heavy Duty CNG.

The Group continued research and development of technologies that will use natural gas even more efficiently. Advances in engine technology that leverage the properties of natural gas offer significant potential for achieving solutions to meet the CO_2 emissions targets being phased in across Europe through 2020.

Fiat maintained its long-standing leadership in biofuel vehicles in Brazil with 744,100 Flexfuel and TetraFuel vehicles sold in 2013, accounting for approximately 97.5% of vehicles sold by the Group. Flexfuel technology enables use of varying blends of gasoline and bioethanol, while the TetraFuel engine is the first in the world capable of running on four different fuels: bioethanol, Brazilian gasoline (refined crude oil and 22% anhydrous ethanol), standard gasoline and natural gas.

Alternative Propulsion Systems

The Group is also developing alternative propulsion systems. In 2013, the Fiat 500e battery electric vehicle was launched for sale in the U.S. market with an Environmental Protection Agency (EPA) label of 108 highway MPGe[(2)] and a class-leading 87 miles of combined city/highway driving range. Customers will spend an estimated USD 500 a year to power the vehicle assuming a 15,000 mile annual distance, according to the EPA. The Fiat 500e battery-electric drive system was included in Ward’s 10 Best Engines ranking for 2014 and is the lone representative of electric vehicle technology on the list.

[(2)] MPGe is the measure devised by the U.S. Environmental Protection Agency for determining how many miles an electric vehicle can travel on a quantity of battery-generated electricity having the same energy content as a gallon of gasoline.

Innovative Vehicle Architectures

Solutions for an optimal balance between vehicle safety, comfort and emissions levels are focused on minimizing vehicle weight, aerodynamic drag, rolling resistance and the energy demands of auxiliary systems.

In 2013, the Group introduced the latest architectural solutions on the new Fiat 500L Living and Chrysler Group vehicles. High-Strength Steels (HSS), which represent around 72% of the weight of the 500L Living, ensure a strong, rigid structure. The newly-launched 2014 Jeep Cherokee uses 65% HSS, an improvement of 16% over its predecessor, the Jeep Liberty. In addition, optimization of the 500L Living's aerodynamic profile enabled a 10% reduction in the aerodynamic drag coefficient (C_x) compared with the Lancia Musa. The 2014 Ram 1500, with active aerodynamics including grille shutters and air suspension, delivers best-in-class fuel economy and an aerodynamic drag coefficient (C_x) of 0.360.

Sustainable Materials

Research and innovation for materials used in Group vehicles are concentrated in three areas:

- research on new materials and structures to reduce vehicle weight (e.g., high-strength steels, new light alloys, composite plastic materials);
- analysis of biomaterials suitable for automotive applications (e.g., recycled polypropylene reinforced with natural fibers for use in vehicle interiors, and bioplastics from renewable sources);
- identification of alternative uses for materials recovered at end of vehicle life (e.g., use of scrap tires to produce rubberized asphalt).

Promoting Eco-Sustainable Driving

Driving behavior is a significant contributing factor in the environmental impact of vehicles. Aware of the substantial difference drivers can make, Fiat Group has continued to invest in the eco:Drive system, which provides personalized tips to help drivers improve their driving style and, as a consequence, reduce fuel consumption and vehicle emissions. The eco:Drive system is now available on nearly all Fiat and Fiat Professional models sold in Europe, Brazil, the U.S. and Canada.

An analysis of the best drivers revealed that the system can contribute to reducing fuel consumption by as much as 16%. By the end of 2013, eco:Drive had been used by more than 94,000 customers and contributed to annual avoidance of more than 5,800 tons of CO_2 emissions.

On the Fiat 500L, 500L Living and 500L Trekking, the latest version of this application, eco:Drive Live, allows drivers to see tips and suggestions via the new Uconnect multimedia system. Real-time feedback on driving

style enables immediate reductions in fuel consumption and emissions.

New Models of Mobility

The Group's innovation activities also focus on solutions to respond to the emerging mobility needs of customers.

To address those needs, the Group has launched a variety of initiatives.

One of those initiatives is Enjoy, an innovative car-sharing service launched in Milan, Italy, by the energy company ENI, in collaboration with Fiat and Trenitalia. Enjoy is designed to tackle traffic congestion and improve the quality of life for the city's inhabitants. Fiat is the vehicle supplier for the project, the largest car-sharing fleet in Italy with a total of 640 Fiat 500s and 500Ls. Innovative features of the service include online or smartphone app sign-up and management, as well as the ability to instantly select from a pool of available vehicles parked at locations around the city and to leave the vehicle at any of the approved parking facilities within the service coverage area.

Another Group project is easygo, which is targeted at the approximately 18,000 employees who commute to and from the Group's Mirafiori complex in Turin, Italy. Through a dedicated portal, employees can arrange car-pooling with coworkers and access updated information on public transport and mobility services. The principal benefits expected from the 'easygo' project include a reduction in the environmental impact of daily commuting to and from the complex, as well as direct benefits to employees such as reductions in commute times, cost, stress and the risk of accidents.

Naturally, youth have an important part to play in any discussion about the future of mobility. Fiat launched the Fiat Likes U project in 2012 (in collaboration with the Departments of Education and the Environment in Italy) with students from 8 universities throughout Italy taking part. The project represents the first time in Europe that an automaker has worked with universities on an initiative to promote environmental awareness and the use of eco-friendly cars using the three-pronged approach of Mobility (free car-sharing service for students), Study (eight €5,000 university scholarships and eight seminars conducted by Fiat managers) and Work (eight paid internships within Fiat Group).

The initiative has proven extremely successful: more than 6,000 students used the car service in 2012 and 2013, which includes a fleet of Fiat Pandas and 500Ls, for 28,000 trips totaling 320,000 km. In addition, there were more than 180,000 subscribers to the likesu.fiat.it website.

During the year, Fiat decided to expand the project to other European universities in the Erasmus network, beginning with the Royal College of Art in London.

As part of the program with Turin Polytechnic and in collaboration with ATA and CRF, three new voluntary courses were launched in 2013 focused on environmental sustainability and certain aspects of emissions reduction. Organized as Voluntary Educational Programs and Summer Schools, the programs provided 120 hours of training for Automotive Engineering students, giving them direct access to the latest know-how from professionals working directly in the field.

Fiat Group is also a Global Partner of Expo 2015 in Milan, a non-commercial Universal Exposition oriented towards interpreting the collective challenges faced by humanity. The Expo 2015 theme of "Feeding the Planet, Energy for Life" is perfectly matched to the Group's own commitment to the environment. The Group will provide a fleet of vehicles which will be used for transport within the Expo area and as courtesy cars for delegations visiting from around the world.

In the United States, Chrysler Group has been heavily engaged in research on future social and technological trends that will affect nearly every aspect of the business - from design to manufacturing, marketing and human resources. This research is organized around five driving forces: cities, lifestyle, work, health and energy. The

findings from this research will enable Fiat-Chrysler to more successfully anticipate evolving consumer needs and behaviors.