



Introduction to the European Green Cars Initiative

In response to the financial and economic crisis, the European Commission launched in November 2008 the European Economic Recovery Plan aiming to restore consumer and business confidence, restart lending, stimulate investment in the EU's economies and create jobs.

The European Green Cars Initiative (EGCI) Private Public Partnership (PPP) - www.green-cars-initiative.eu - was one of the three¹ research PPPs established under the European Economic Recovery Plan. On top of releasing 5 billion Euro in European Investment Bank loans, the EGCI PPP made available a total of one billion EUR for R&D through joint funding by the European Union and industry, with 500 million Euro funding from the European Union for collaborative research and development projects. The initiative was implemented under the following programmes in Framework Programme 7 (FP7): Sustainable Surface Transport (SST), Information and Communication Technologies (ICT), Nanosciences, Nanotechnologies, Materials & New Production Technologies (NMP), Environment (ENV) and Energy.

The EGCI activities are complemented by other FP7 instruments, e.g. the Joint Undertakings Eniac, Artemis and Fuel Cells and Hydrogen, and by pre-deployment pilots within the Competitiveness and Innovation Programme (CIP). The latter is supporting electro-mobility and integration into smart grids, sustainable cities, and future internet technologies.

In addition to R&D funding, demand-side measures and regulatory actions, such as the reduction of car registration taxes on low-CO₂-vehicles to stimulate the purchase of cars by the citizens were taken by Member States and the EU.

A key focus of the EGCI was on electric vehicle technologies, the integration of electric vehicles into smart electricity grids and in particular on highly energy-efficient ICT components and solutions for fully electric vehicles along sustainable automotive electrochemical storage applications.

The European Commission has been in permanent dialogue with the Industry represented by the three European Technology Platforms (ETPs): European Road Transport Research Advisory Council (ERTRAC), European Technology Platform on Smart Systems Integration (EPoSS), SmartGrids and other representative stakeholders. An Industrial Advisory Group was established as a high-level forum for strategic dialogue.

¹ The other PPPs in the re manufacturing (Factories of tl



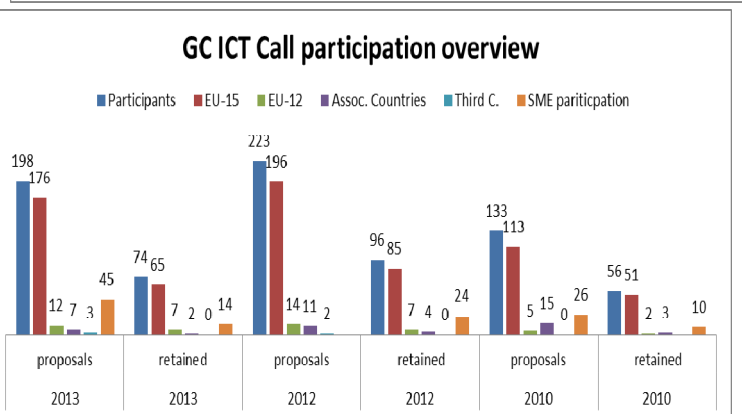
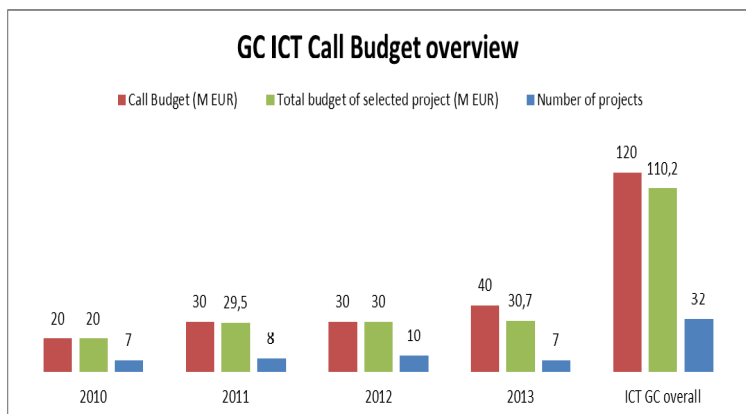
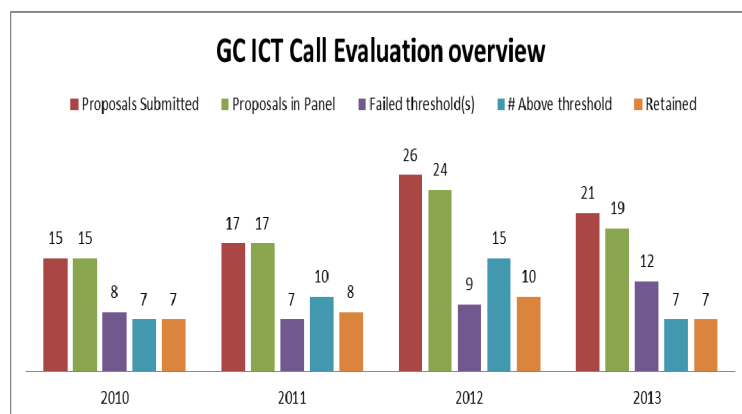
Projects supported under the ICT part of the FP7 programme addressed the development of electric powertrains, battery and energy management systems, electric/electronic architectures, vehicle dynamics and vehicle-to-grid applications, all dedicated to fully electric vehicles and their components. A fully electric vehicle was expected to have a significant driving range on pure battery based power. Optimisation of human friendliness, functionality and energy efficiency, both at single vehicle and fleet levels has been in the scope of the programme since its inception.

Project Portfolio - DG CONNECT, Unit A.4 "Components"

ICT components play an increasingly important role in electric vehicles, with applications ranging from electric powertrains and battery management, to smart, cooperative mobility systems. As a result of the four calls for proposals published from 2009-2012 with a total indicative budget of €120 million, over 30 R&D projects were selected for funding. A statistical overview of the participation in the EGCI PPP calls in general and the ICT calls in particular is given below:

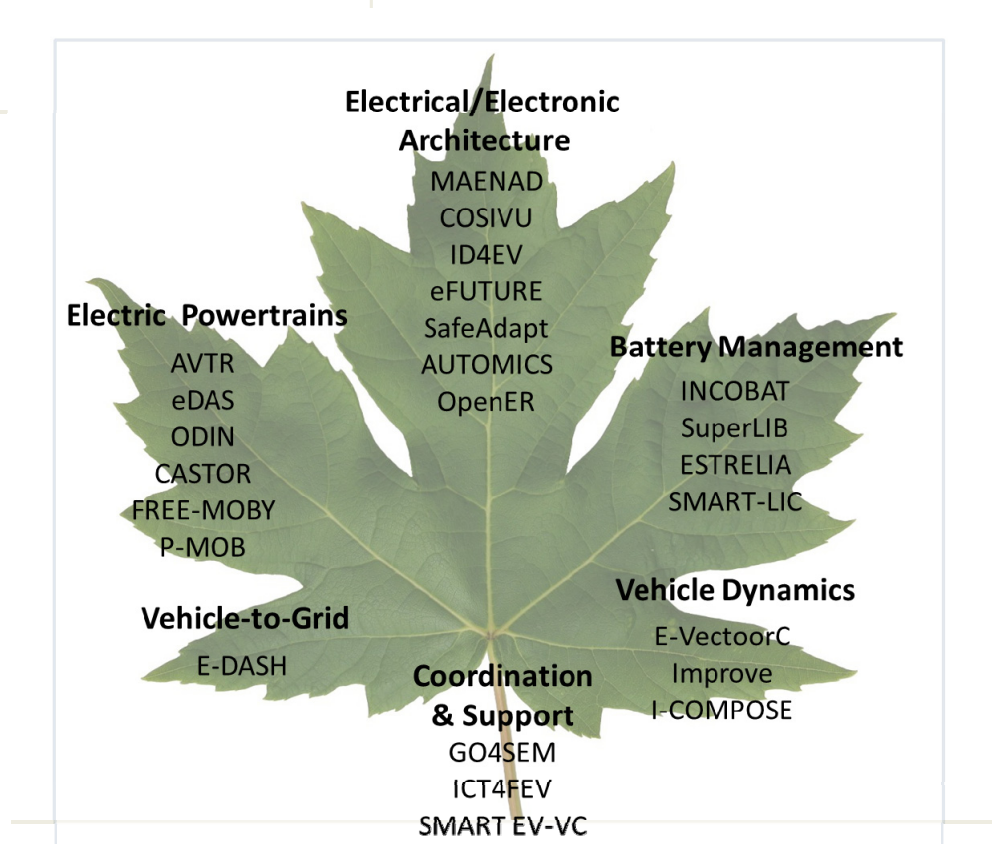
	NMP	ICT	TRS	ENE	ENV	Total FP7
Budget (M€)	60	120	220	50	50	500
Final (M€)	60	110	233,7	10	15,5	429,2

Call	Number of submitted proposals	number of retained proposals	Success ratio
2010	94	31	33%
2011	88	25	28%
2012	112	32	29%
2013	91	25	27%
Cummulative	385	113	29%



In addition to the public financial support, the PPP instrument provided a framework for swift and effective cross-border cooperation of automotive players across the value-chain creating valuable business-links. The roadmap elaborated by the EGCI Ad-hoc Industrial Advisory Group sets out the industrial research priorities and formed the backbone for the work programme and the calls launched by the Commission. The roadmap has been regularly updated to reflect industrial priorities and the evolution of technology developments.

The projects retained from the four calls cover a range of technologies and systems and can be clustered along the following topics²: Electric Powertrains, Battery Management, Vehicle Dynamics, Electrical/Electronic Architectures, Vehicle-to-Grid technologies and Coordination Actions.



In addition to the GC PPP 113 projects, about 400 research projects addressing amongst others the take-up of electro-mobility have been started in EU Member States since the launch of the PPP. At the same time EIB lending has been provided through the European Clean Transport Facility. Focus is on energy-efficient, clean and safe vehicle technologies and lending amounted by 2012 to €55 Bn of which €4.1 Bn are dedicated for passenger cars and electric powertrains³.

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Level 2 (GC ppt proposal)	Definition (proposed)
Electric Powertrains	Components that generate electric power and deliver it to the road surface. Including the e-engine, transmission, gearbox, drive shafts, differentials, and the drive wheels
Battery Management	Monitor and control function system that manages a rechargeable battery (cell or battery pack). Battery state monitoring, calculating secondary data, reporting that data, protecting the battery, controlling its environment, and / or balancing it
Vehicle Dynamics	Vehicle and environmental characteristics that contribute to successfully modelling and controlling vehicle dynamic behaviour.
Electrical/Electronic Architecture	Electrical and electronic system and subsystem design, the physical and functional partitioning and the physical layout of subsystems within the vehicle - systems platform to architect, define, simulate, and validate various E/E components, which include embedded software, mechatronic, and electrical.
Vehicle-to-Grid	Connection of the vehicle to the grid by enabling controlled flow of energy and power through safe, secure, energy efficient and convenient transfer of electricity and data
Coordination & Support	Coordination and networking of projects, programmes and policies: Roadmap & priorities; European value chain; Recommendations & standards

³ <http://www.smartev-vc.eu/workshops/electric-vehicle-batteries-moving-from-research-towards-innovation/documents/session-3/MuentBrussels10042013Finalversion.pdf>

Achievement and progress towards the objectives

The automotive sector is the engine of Europe's economy. Indeed, it is not only important because of the size of the industry and related direct and indirect employment in Europe, but also because it is a main technology driver in particular for the ICT research. Within an electrical car ICT will have a large share of over 40% in its value. ICT currently is and will become an even more important differentiator. The European industry remains committed to electrification, and has restated its commitment as a steering member of the new European Green Vehicles Initiative (EGVI) PPP. In the EGVI roadmap⁴ the industry engages to match the EU funding with equal private funding. It also claims that approximately €30 Bn is invested each year in R&D by the European automotive industry from own private sources, the majority being allocated to energy efficiency.

To date, most of GC ICT research projects are on-going, therefore it is still early to draw definite conclusions, however the high participation and the strong commitment of industrial players in projects gives confidence that quality and focused research will contribute to the much expected increase of ICT functionalities in future cars.

Some projects launched in the first calls already reached significant results: E-VECTOORC has demonstrated vehicle stability through multi-motor controls and the development of an efficient motor. eFuture and OpEneR combine a series of ICT technologies and architectures to improve control and energy optimisation in a multi-motor configuration. ID4EV has developed electrified braking and suspension systems and a custom-tailored HMI while P-MOB has designed and built a novel light electric vehicle. CASTOR designed a distributed power train architecture to reduce power ratings of the traction drive. Last but not least, the Coordination Action ICT4FEV has been very proactive in the EV community and contributed significantly to the elaboration of strategic roadmaps.

Further results are expected from running projects, as follows:

AUTOMICS - Reliable design of automotive logic and power devices on the same chip
AVTR - Development of a complete electrical powertrain optimised as a whole of systems
COSIVU - New system architectures for drive-trains
eDAS - Advanced components and a novel computing architecture for multi-nature energy flow
E-DASH - EV charging optimisation through aggregated fleet management and energy pricing
ESTRELIA - BMS for dual batteries (Li-Ion + supercaps) with focus on safety
FREE-MOBY - EV integration with photovoltaics, including partial battery swapping
HEMIS - Electrical powertrain health monitoring for increased safety
I-COMPOSE - Over-arching energy optimisation in EVs
IMPROVE - Performance and Road Efficiency of Electric Vehicle Electronics
INCOBAT - Platform concept for next generation battery management
MAENAD - EAST-ADL extension to facilitate dependable, efficient and affordable FEVs
ODIN - Integrated high speed motor with gearbox and electronics
SafeAdapt - Fail-safe architecture by real-time reconfiguration
Smart-LIC - New BMS with SIP modules integrated directly on the Li-cell
SuperLIB - BMS for dual Li-batteries (High-energy and high-power)
Smart EV-VC - Coordination Action

⁴ <http://www.green-cars-initiative.eu/public/documents/PPP-EGVI-Roadmap-07-2012.pdf>

The Final Assessment of the Research PPPs in the European Economic Recovery Plan⁵ has been finalised in mid-2013 drawing the following conclusions with respect to the Green Cars pillar:

- Technology development and take-up has been accelerated primarily through inclusion of the broad value chain of car production and a large number of new players. For example, within the GC PPP cluster meeting reports have revealed promising progress with some evidence that impacts might be achieved faster than the 7 to 8 years that is typical for getting a new technology into the industry, particularly in the area of power electronics.
- The GC PPP has contributed to a strengthened EU industry and particularly relevant are the achievements on power electronics, where European Semiconductors companies are the largest supplier of the electronics enabling electro-mobility used by Chinese OEMs, battery management systems and in the high level of system integration.
- The positive result of demonstration projects in the GC PPP shows that these activities should be promoted to demonstrate the ease of electro-mobility and facilitate its uptake.
- GC PPP roadmap with its periodic revisions is considered as a success and a minimum bi-yearly revision exercise should be promoted in order to respond to technology and market evolutions.
- A growing commercial interest of the EU automotive sector in GC has been noted, driven by the high priority of the topic at EU policy-making level and by the business need for EU companies to adapt to technological changes and consumer priorities.
- One of the main achievements is considered to be the inclusion of the entire value chain and particularly relevant is the participation of new players. These promoted significant developments with limited funding that then influenced organisations further up the chain. As such, the efficiency of the GC PPP is described as causing supply chain push rather than large automotive industry pull.
- The topics addressed in the GC calls have promoted the formation of well-structured consortia. Several projects involve SMEs, in cooperation with OEMs and Tier-1s, that otherwise would not have participated in research activities or would not have actively joined proposals for calls with low success rates. This makes the transition from research to production less segmented and more fluid.
- On top of the €439 million spending of the GC PPP the project spending on electromobility in Europe has been about €1.5Bn. It is considered that the GC PPP has led to an increased MS awareness and national support for research by leading the political commitment to stimulate research in the field.

In conclusion the GC ICT programme has brought research and the full industrial vehicle value chain together. Its results will contribute to upcoming vehicle electrification and ultimately to a

more sustainable and greener mobility in Europe, increasing the quality of life of its citizens while improving the competitiveness of the European ICT and automotive industries.

Sources:

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- Article: <http://www.greenfleet.net/features/133-european-initiatives/1250-smart-mobility-building-the-pathway-for-electric-vehicles>
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- EIB presentation: <http://www.smartev-vc.eu/workshops/electric-vehicle-batteries-moving-from-research-towards-innovation/documents/session-3/MuentBrussels10042013Finalversion.pdf>