



European
Commission

New public-private partnerships for research in the manufacturing, construction and automotive sectors

European PPP research
supports economic recovery
Progress Report: July 2012

EUROPEAN COMMISSION

Directorate-General for Research and Innovation

Directorate G — Industrial Technologies

Unit G.2 — 'New forms of production'

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Luxembourg: Publications Office of the European Union, 2012

ISBN 978-92-79-24956-3

doi:10.2777/98168

Pictures: Shutterstock

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Printed in Belgium

PRINTED ON ELEMENTAL CHLORINE-FREE BLEACHED PAPER (ECF)

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Boosting innovation in key European industries



Three research public-private partnerships (PPPs) have been implemented as part of the European Economic Recovery Plan, adopted in November 2008, to tackle the consequences of the global economic downturn that badly affected key sectors of European industry. Launched by the European Commission in early 2009, these PPPs fund research and innovation in the manufacturing, construction, and automotive sectors to boost competitiveness and increase employment.

The implemented partnerships are:

- in the manufacturing sector, a EUR 1.2 billion 'Factories of the Future (FoF)' PPP initiative to promote the competitiveness and sustainability of European manufacturing industry;
- in the construction sector, a EUR 1 billion 'Energy-efficient Buildings (EeB)' PPP initiative to promote green technologies and the development of energy efficient systems and materials in new and renovated buildings to radically reduce their energy consumption and CO₂ emissions; and
- in the automotive sector, a EUR 5 billion 'Green Cars (GC)' PPP initiative to improve the sustainability of all European road transport and accelerate the move towards electrification of road and urban transport. Besides EUR 1 billion for research activities, the budget includes a EUR 4 billion loan facility for other research and support measures from the European Investment Bank (EIB) under its European Clean Transport Facility (ECTF).

Positive assessment and experiences

The first generation of the PPP projects is now moving towards a successful conclusion. A number of projects have already filed patent applications, and more are expected to do the same in the coming months. Results and exploitation plans are also becoming much more tangible, with target markets starting to be more clearly defined.

The interim assessment of the three PPPs by an Expert Group, published in May 2011, is supportive of these initiatives, which are seen as a useful approach to research and innovation with direct industrial benefit. The PPPs were found to have been successful in engaging top industrial companies, in particular SMEs, besides many research organisations and universities, which has led to a high participation of large industry and SMEs, totalling on average more than 55 % of the participants in the PPP projects, and with SMEs receiving above 20 % of the total EC funding. A number of potential improvements were also suggested such as better coordination across the various participating FP7 Themes and strengthening the dissemination of the results.

Partnering

The key role of partnering is recognised in a European Commission Communication, published in September 2011, entitled 'Partnering in Research and Innovation'. This document addresses the importance of partnering activities involving the European Union, the Member States and the European industry which can stimulate economic growth and employment, and provide the basis for tackling the major socio-economic and environmental challenges. Partnering is especially important in the current economic crisis as the squeeze on public and private investment in research and innovation means that Europe must use existing resources even more effectively.

Initial partnering work in the PPPs was focused on the quick delivery of results and on the exploration of a strategy for the longer term. To structure dialogue between the public and private sides of each PPP, the European Commission invited representatives of the industrial and research stakeholders to take part in Ad-hoc Industrial Advisory Groups, which helped identify the research and innovation priorities. This approach also led to the preparation of the three Multi-annual Roadmaps, which cover the period

up to the end of 2013. Work is now in progress with the aim to have new roadmaps ready by early 2013 to support the proposed continuation of PPP activities under Horizon 2020.

Long-term strategy

Even though they were launched under the short-term European Economic Recovery Plan, the PPPs are strongly contributing towards the development of a knowledge-based and low-carbon EU economy, which is key to achieving the aims of the Europe 2020 Strategy. This strategy, with the Innovation Union flagship at its core, seeks to guide Europe's recovery, as well as the creation of a more competitive, sustainable, and inclusive economy.

This strategic alignment of private and public research objectives has been facilitating an increased industrial participation in the European R&D efforts, providing more effective outputs. However, nothing stands still for these PPPs in a fast changing world. While manufacturing output is 11 % higher than its lowest value in early 2009, it is still some 9% below its former peak in early 2008. Economic data show growth in the automotive sector in the years 2010 and 2011, but the short term outlook for this sector is pessimistic in terms of employment and new orders. The situation in the construction sector is still showing a substantial contraction.

The European Economic Recovery Plan and the establishment of the PPPs was a response to an economic downturn. However, the nature of the macro-economic difficulties has changed to one of heavy national debts with the inevitable cuts in public sector spending resulting in a dampening of growth. In the meantime, tackling the problem of resource efficiency and climate change mitigation remains a pressing challenge for all the sectors represented in the PPPs. Competitive pressures, arising from the continuing development of powerful competitor economies in Asia and South America, are also increasing.

This set of circumstances is unique in Europe's long history, and these challenges pose threats to Europe's position in the world, which the PPPs will have to continue to address. Europe needs to undertake R&D with the applied research competencies of industry and universities synergistically combined, using approaches such as the PPPs that enable results to be brought to market much faster than at present.

Horizon 2020

The Commission's proposal for Horizon 2020 was adopted on 30 November 2011 and is presently in discussion at the Council and the European Parliament. With a budget of

EUR 80 billion for the period 2014-2020, it would bring together in a single coherent programme the entire EC funding for research and innovation. Horizon 2020 will invest in research and innovation, in particular by promoting activities where industry contributes to setting the agenda. To help ensure that the European Union remains globally competitive in key industries, innovation activities should be enhanced.

For any PPPs to be supported as part of Horizon 2020, they will need to meet all the required criteria. In the European Commission's proposal, these include: demonstrating that they provide added value at EU level; a scale of impact on industrial competitiveness, sustainable growth, and socio-economic issues which is demonstrably greater than what would be achieved without using the PPP model; organisation founded on the principles of transparency and openness; clear long-term commitment from all partners based on a shared vision and clearly defined objectives; a scale of resources deployed that leverages additional investments in research and innovation; clear definition of roles for each of the partners; and, agreed key performance indicators.

Both the public side and the private side in each of the PPPs are keen on addressing together all these requirements, so that these PPPs may continue under Horizon 2020.

The three PPPs need to address the challenge of developing the partnership so that it becomes a new model for organising research related to their sector. The key issue is how to bring results to market much faster than at present. A holistic approach is part of the response to such a challenge, ensuring that barriers to exploitation are addressed during the execution of RTD projects, and focussing on both research aspects and innovation issues.

4th Calls

Following the success of the first three years, a fourth series of cross-thematic calls, with a total indicative EC contribution of EUR 593.45 million, is launched in July 2012 by the FP7 Themes involved, as detailed in the Work Programme 2013.

Factories of the Future

The Factories of the Future (FoF) PPP is a collaboration between the European Commission and industry to support the development of enabling technologies and to foster innovation in the EU manufacturing sector, with a particular emphasis on SMEs. Its focus is on restoring growth and achieving sustainability, which requires boosting competitiveness and a strategic shift in Europe from cost-based competition to an approach based on the creation of higher added value.

Manufacturing plays an important role in the European economy, accounting for 21 % of the EU's GDP, and 30 million jobs – around 20 % of EU employment – with twice that number in related services. There are of the order of 230 000 enterprises, most of which are SMEs. European manufacturing is also dominant in international trade, leading the world in car manufacture, industrial machinery and agricultural engineering.

Responding to an increasing demand for more customised and higher quality products is important for European manufacturing. There is also a need to address the 'green' challenge of producing more, while consuming less material, using less energy and creating less waste. Both research and demonstration activities are important in this context, as is adopting an approach based on eco-design concepts.

Successful Calls

The FoF initiative involves financial support from the NMP (Nanotechnologies, Materials and Production technologies) and ICT (Information and Communication Technologies) Themes of FP7.

Good participation from industry has been achieved in the first three FoF Calls for Proposals, with many high quality proposals received. The overall EC funds provided have already reached EUR 415 million. In total, 542 proposals were submitted, with 95 retained for funding, including partners from 29 countries, and representing a success rate close to 18 %. Industry represents on average 59 % of the partners (and receives 52 % of the EC funding) with industrial SMEs corresponding to 29 % of the partners (and 24 % of the EC funds).

Current strategy

In January 2010, the FoF PPP Ad-hoc Industrial Advisory Group produced the Multi-annual Roadmap covering the period 2009-2013, which identified the following strategic sub-domains:

- sustainable manufacturing;
- ICT-enabled intelligent manufacturing;
- high performance manufacturing; and
- exploiting new materials through manufacturing.

Achieving the best possible coverage of this Multi-annual Roadmap was taken into account when defining the research topics for the fourth FoF Call, included in WP2013 (with a total EC contribution of EUR 230 million). The relevant Call information is shown in the table on the next page.

To help enlarge the impact and visibility of the PPP results, starting with the third Call there has been an increased emphasis on innovation activities, in particular through demonstration-targeted projects. These targeted projects address issues such as standardisation, prototypes, up-scaling and pilot implementation, while maintaining links with an equivalent amount of research activities. This also helps to improve the attractiveness of the FoF PPP to SMEs, while at the same time increasing the leverage effect on private sector funding.

Progress

In total, 61 projects are now running, based on the proposals that were selected from the first and second Calls. An additional 34 projects resulting from the third Call are expected to start in the very near future.

Topics covered include the eco-factory, towards zero-defects manufacturing, virtual and smart factories, sustainable predictive maintenance for production equipment, high-performance manufacturing and high-precision technologies for high-quality 3D micro-parts.

Challenges for the future

A second FoF Impact Workshop took place in March 2012. The main aims were to promote networking and exchange of information among the running projects and to enable discussion regarding how to enhance the expected impacts of the PPP. A wide range of issues have been identified by the projects as possible barriers to achieving the impacts. The challenge is finding ways of working together to address these pre-competitive issues.

In the future the FoF PPP needs to move forward from the initial short-term mode of the present period linked to the Recovery Plan, into an approach that reflects the longer-term need to re-shape EU manufacturing so that it is able to compete in global markets while maintaining its activities in Europe. Updating the Multi-annual Roadmap is therefore a key issue for the PPP, and the European Factories of the Future Research Association (EFFRA) is launching a wide stakeholder consultation.



FoF CROSS-THEMATIC CALL IN JULY 2012

FP7 Theme	Topic	Funding scheme	Budget (EUR M)	Deadline
NMP	FoF.NMP.2013-1 Improved use of renewable resources at factory level	DEMO-targeted collaborative projects	160	4 Dec 2012
	FoF.NMP.2013-2 Innovative re-use of modular equipment based on integrated factory design	DEMO-targeted collaborative projects		
	FoF.NMP.2013-3 Workplaces of the future: the new people-centred production site	Small or medium-sized collaborative projects		
	FoF.NMP.2013-4 Innovative methodologies addressing social sustainability in manufacturing	Coordination and Support Actions (Support action)		
	FoF.NMP.2013-5 Innovative design of personalised product-services and of their production processes based on collaborative environments	Large-scale integrated collaborative projects		
	FoF.NMP.2013-6 Mini-factories for customised products using local flexible production	DEMO-targeted collaborative projects		
	FoF.NMP.2013-7 New hybrid production systems in advanced factory environments based on new human-robot interactive cooperation	Large-scale integrated collaborative projects		
	FoF.NMP.2013-8 Innovative strategies for renovation and repair in manufacturing systems	Large-scale integrated collaborative projects		
	FoF.NMP.2013-9 Advanced concepts for technology-based business approaches addressing product-services and their manufacturing in globalised markets	Small or medium-sized collaborative projects		
	FoF.NMP.2013-10 Manufacturing processes for products made of composites or engineered metallic materials	Small or medium-sized collaborative projects		
	FoF.NMP.2013-11 Manufacturing of highly miniaturised components	SME-targeted collaborative projects		
ICT	FoF-ICT-2013.7.1 Application experiments for robotics and simulations	Collaborative Projects (IP only) and Support Actions (SA only)	70	
	FoF-ICT-2013.7.2 Equipment assessment for sensor and laser based applications	Collaborative Projects (IP only) and Coordination Actions (CA only)		

Note: The above information is only indicative since the Calls of the Thematic Workprogrammes in 2013 had not been published at the time of preparing this brochure. Full details on topic content, the specific type of funding scheme and budget are provided in the relevant Workprogrammes for 2013.

Energy-efficient Buildings

The European Commission works with industry through the Energy-efficient Buildings (EeB) PPP to support research and demonstration activities that aim at the construction or renovation of European buildings to high energy-efficiency standards. The focus is on promoting green technologies and the development of energy-efficient systems and materials to boost the construction sector and to reduce energy consumption and CO₂ emissions of new and renovated buildings.

Construction activities were providing in recent years around 16 million jobs in the EU. This sector generates about 10 % of EU GDP and is also responsible for 33 % of Europe's CO₂ emissions.

The current EU stock of residential and commercial buildings is some 160 million. In all major European countries, new construction adds less than 2 % per year to the building stock. Hence, to achieve an energy-efficient built environment there is a need for a strong focus on the renovation of existing buildings.

Key issues for this PPP are ensuring optimisation of both building and district-level concepts, with significant attention paid to the development and integration of design and simulation tools, new materials, building systems and equipment and ICT for energy efficiency.

Successful Calls

The EeB initiative involves financial support from the NMP (Nanotechnologies, Materials and Production technologies), the ICT (Information and Communication Technologies), the Energy, and the Environment (including Climate Change) Themes of FP7.

Good participation from industry has been achieved in the three EeB Calls for Proposals issued so far, with many good quality proposals received. The overall EC funds provided have already reached EUR 290.5 million. In total 315 proposals were submitted, with 72 retained for funding, including partners from 30 countries, and representing a success rate close to 23 %. Industry represents on average 52 % of the partners (and receives 45 % of the EC funding) with industrial SMEs corresponding to 23 % of the partners (and 18 % of the EC funds).

Current strategy

In January 2010, the Ad-hoc Industrial Advisory Group presented the EeB Multi-annual Roadmap, which identified a series of strategic sub-domains:

- energy-efficient refurbishment of buildings;
- neutral/energy-positive new buildings;
- energy-efficient districts/communities;

- horizontal technological aspects; and
- horizontal organisational aspects.

The Multi-annual Roadmap has helped focus stakeholders on a long-term common agenda that guarantees continuity and keeps industry keen to participate. The optimal coverage of this Multi-annual Roadmap was taken into account when defining the research topics for the Fourth EeB Calls, included in WP2013 (with a total EC contribution of EUR 246 million). The relevant Call information is shown in the table on the next page.

Progress

As a result of the first two Calls, 41 projects are currently in their execution phases. An additional 31 projects resulting from the third Call will be joining these shortly.

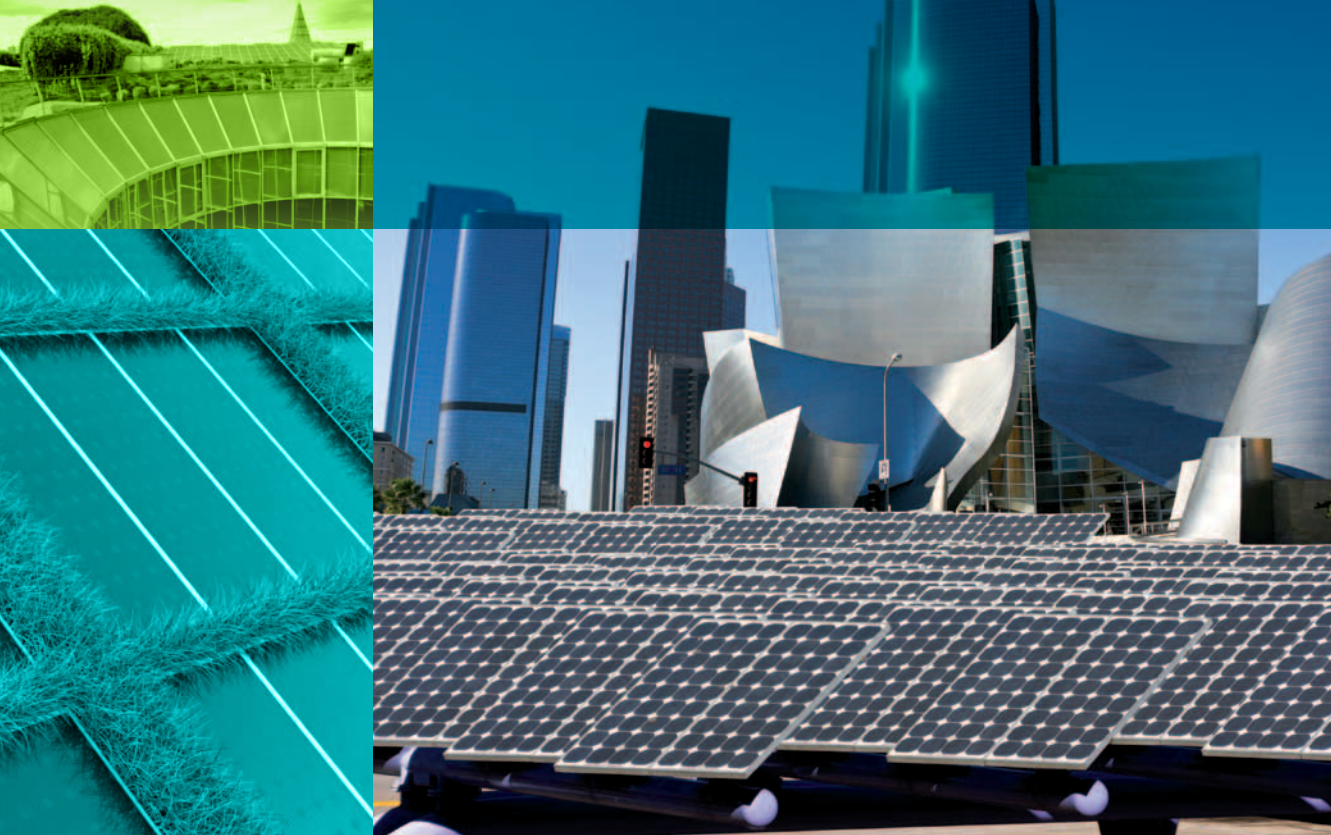
Topics covered include new materials for energy-efficient building components, nanotechnology-based approaches for high-performance HVAC systems, energy-saving technologies and a systemic approach for the retrofitting of existing buildings, ICT for energy-efficient buildings and energy-positive neighbourhoods and the demonstration of nearly zero-energy building renovation for cities and districts,

Challenges for the future

A second EeB Impact Workshop took place in March 2012. The primary aims were to promote networking and exchange of information among the research projects and enable discussion among project participants concerning impacts of the PPP and how these can be further enhanced. Among the recommendations emerging from the workshop it is worth mentioning: more effective ways of disseminating project outcomes and engaging end-users; and exploring new business models and financing mechanisms for the exploitation of new technologies.

Projects need to address the requirement for better energy performance tools and the challenge of standardisation. They also need to tackle industry uptake of results by attending to the regulatory interventions that are required, as well as engaging more effectively with users, and finding ways to improve dissemination of project outcomes.

For the PPP, the challenge is now to build upon the existing EeB PPP Multi-annual Roadmap, and the E2B Association has started a process to identify the most appropriate research and innovation priorities for the period 2014-2020 and is launching a wide stakeholder consultation.



EeB CROSS-THEMATIC CALLS IN JULY 2012

FP7 Theme	Topic	Funding scheme	Budget (EUR M)	Deadline
NMP	EeB.NMP.2013-1 Nanotechnology for multifunctional lightweight construction materials and components	Small or medium-sized collaborative projects	110	4 Dec 2012
	EeB.NMP.2013-2 Safe, energy-efficient and affordable eco-innovative materials for building envelopes and/or partitions to provide a healthier indoor environment	Large-scale integrated collaborative projects		
	EeB.NMP.2013-3 Integration of technologies for energy-efficient solutions in the renovation of public buildings	DEMO-targeted collaborative projects		
	EeB.NMP.2013-4 Integrated control systems and methodologies to monitor and improve building energy performance	Large-scale integrated collaborative projects		
	EeB.NMP.2013-5 Optimised design methodologies for energy-efficient buildings integrated in the neighbourhood energy systems	Large-scale integrated collaborative projects		
	EeB.NMP.2013-6 Achieving high efficiency by deep retrofitting in the case of commercial buildings	Large-scale integrated collaborative projects		
Environment (including Climate Change)	EeB.ENV.2013.6.3-4 Energy efficient retrofitting and renewal of existing buildings for sustainable urban districts	Collaborative Project	6	4 Dec 2012
ICT	ICT-2013.6.4 Optimising Energy Systems in Smart Cities	Collaborative Projects (STREP only) and Coordination and Support Actions (CSA)	40	
Energy	ENERGY.2013.8.8.1 Demonstration of optimised energy systems for high performance-energy districts	Collaborative projects (predominant demonstration component)	90	

Note: The above information is only indicative since the Calls of the Thematic Workprogrammes in 2013 had not been published at the time of preparing this brochure. Full details on topic content, the specific type of funding scheme and budget are provided in the relevant Workprogrammes for 2013.

Green Cars

The European Green Cars initiative is broader in scope than the other two PPPs. It not only includes EUR 1 billion for research, but also a substantial package of financial and demand-side measures to support the development of new and sustainable forms of road transport, giving a combined funding of EUR 5 billion. Under the Green Cars initiative, research on trucks, internal combustion engines, bio-methane use, and logistics is also undertaken. However the main focus is on the electrification of mobility and road transport.

The automotive industry is a key European industrial sector and accounts for close to 8% of total manufacturing value added and about 6% of total manufacturing employment with over two million jobs. It also provides indirect employment to over 10 million people.

Road transport is responsible for around 20% of greenhouse gas emissions and 30% of CO₂ emissions in the EU. In Europe, 73% of oil is consumed in transport. A green approach is therefore essential to achieve EU and world targets for emissions reductions, and also decreasing oil dependency.

Successful Calls

The PPP receives financial support from the Sustainable Surface Transport, NMP (Nanotechnologies, Materials and Production technologies), ICT (Information and Communication Technologies), Environment (including climate change), and Energy Themes of FP7.

Good participation from industry has been achieved in the three GC Calls for Proposals issued so far, with many high quality proposals received. The overall EC funds provided have already reached EUR 321.75 million. In total 293 proposals were submitted, with 90 retained for funding, including partners from 31 countries, and representing a success rate close to 31%. Industry represents on average 55% of the partners (and receives 52% of the EC funding) with industrial SMEs corresponding to 18% of the partners (and 15% of the EC funds).

Current strategy

In early 2011, the GC PPP Ad-hoc Industrial Advisory Group produced its Multi-annual Roadmap covering the period until 2013.

The Multi-annual Roadmap comprises three pillars: electrification of road transport; long-distance transport; and logistics and co-modality. These three pillars represent the key areas to achieve energy efficiency improvements, CO₂ emissions reduction and reliable logistics and mobility. They also offer important opportunities for Europe to turn

its outstanding knowledge base in the field of clean and energy-efficient vehicles and transport solutions, into innovations bringing substantial benefits both environmentally and socio-economically.

The optimal coverage of this Multi-annual Roadmap has been taken into account when defining the GC research topics for the GC Fourth Call included in WP2013 (with an indicative total EC contribution of EUR 117.45 million). The relevant Call information is shown in the table on the next page.

Progress

In total, 54 projects are now running as a result of the first and second Calls. An additional 36 projects resulting from the third Call will start in the near future.

The running projects cover a wide range of research topics. Included in these are power controllers, novel magnetic materials, innovative motor designs, and new air-conditioning systems. Economic and environmental studies are also being undertaken, for example, a comparison between emissions from the electrical power supply needed for electric vehicle charging and the emissions resulting from internal combustion engines.

In 2012 the Green Car PPP initiated steps to create a non-profit association similar to those set up by the other two PPPs.

Challenges for the future

A Strategy and Networking Event was held in September 2011 to consider future R&D priorities related to electrification for the European Green Cars Initiative. A further workshop will be held in July 2012. The aims of this second workshop are to: build a critical mass of activities within the GC; identify potential synergies and relevant topics for further cooperation; and improve the performance of individual projects.

The Green Car PPP has initiated a process of updating its Multi-annual roadmap. The initial concept for the new Roadmap is to focus on issues related to energy efficiency, considering all types of vehicles (two-wheelers, cars, trucks and buses). The research would address modules, systems, and vehicles, as well as the infrastructure.



GC CROSS-THEMATIC CALLS IN JULY 2012

FP7 Theme	Topic	Funding scheme	Budget (EUR M)	Deadline
NMP	GC.NMP.2013-1 Improved materials for innovative ageing resistant batteries	Large-scale integrated collaborative projects	20	4 Dec 2012
ICT	GC.ICT.2013.6.6 Electro-mobility	Collaborative Projects (IP, STREP) and Coordination and Support Actions (CSA)	40	
Transport	GC.SST.2013-1. Feasibility analysis and technological development of on-road charging for long term electric vehicle range extension	Collaborative projects	52,45	
	GC.SST.2013-2. Next generation electric motors	Collaborative projects – small or medium-scale focused research		
	GC.SST.2013-3. Future light urban electric vehicles	Collaborative projects – large scale integrating projects		
	GC.SST.2013-4. Demonstration of electric buses as urban public transport	Collaborative projects		
	GC.SST.2013-5. Configurable and adaptable truck	Collaborative projects – small or medium-scale focused research		
	GC.SST.2013-6. High efficiency energy conversion for future heavy duty transport	Collaborative projects – large scale integrating projects		
	GC.SST.2013-7. Technical and operational connectivity in intermodal freight transport	Collaborative projects – large scale integrating projects		
Energy	ENERGY.2013.7.3.1 Planning rules for linking electric vehicles (EU) to distributed energy resources	Collaborative projects	5	
	ENERGY.2013.7.3.2 Enhanced interoperability and conformance testing methods and tools for interaction between grid infrastructure and electric vehicles	Collaborative projects		

Note: The above information is only indicative since the Calls of the Thematic Workprogrammes in 2013 had not been published at the time of preparing this brochure. Full details on topic content, the specific type of funding scheme and budget are provided in the relevant Workprogrammes for 2013.

Further information

General

- Public-private partnerships (PPPs) in research
http://ec.europa.eu/research/industrial_technologies/ppp-in-research_en.html
- FP7 Research Themes and Call information
<http://cordis.europa.eu>
- Joint Statement on the three PPPs and press package of March 2009
<http://ec.europa.eu/research/index.cfm?pg=newsalert&lg=en&year=2009&na=ppp-310309>
- Conference 'From Economic Recovery to Sustainability' (Valencia, Spain, April 2010) focused on the PPPs
<http://www.r2sconference.eu>
- Risk-Sharing Finance Facility
<http://www.eib.org/products/loans/special/rsff/?lang=en>
- Multi-annual Roadmap Factories of the Future
http://ec.europa.eu/research/industrial_technologies/pdf/ppp-factories-of-the-future-strategic-multiannual-roadmap-info-day_en.pdf
- Multi-annual Roadmap Energy-efficient Buildings
http://ec.europa.eu/research/industrial_technologies/pdf/ppp-energy-efficient-building-strategic-multiannual-roadmap-info-day_en.pdf
- Multi-annual Roadmap European Green Cars Initiative
http://www.green-cars-initiative.eu/public/documents/EGCI%20Roadmap.pdf/at_download/file
- Interim Assessment of the Research PPPs in the European Economic Recovery Plan
http://ec.europa.eu/research/industrial_technologies/useful-documents_en.html

External websites

Factories of the Future

- European Factories of the Future Research Association (EFFRA)
<http://www.effra.eu>
- Manufuture Technology Platform
<http://www.manufuture.org>

Energy-efficient Buildings

- Energy-Efficient Buildings Association (E2BA)
<http://www.e2b-jti.eu>
- European Construction Technology Platform
<http://www.ectp.org>

European Green Cars Initiative

- ECGI – European Green Cars Initiative
<http://www.green-cars-initiative.eu>
- ERTRAC – Road Transport Technology Platform
<http://www.ertrac.org>
- EPoSS – European Technology Platform on Smart Systems Integration
<http://www.smart-systems-integration.org>
- SmartGrids – European Technology Platform for the Electricity Networks of the Future
<http://www.smartgrids.eu>
- EIRAC – European Intermodal Research Advisory Council
www.eirac.eu

EUR 25336 — New public-private partnerships for research in the manufacturing, construction and automotive sectors. – European PPP research supports economic recovery – Progress Report: July 2012

Luxembourg: Publications Office of the European Union

2012 — 12 pp. — 17.6 x 25 cm

ISBN 978-92-79-24956-3

doi:10.2777/98168

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Three public-private partnerships (PPPs), established by the European Commission in 2009 in close collaboration with three key European industrial sectors – manufacturing, construction and automotive – have been undertaking research aimed at contributing to renewed industrial growth in the European Union, with accompanying benefits in terms of employment and global competitiveness. With the initiative now moving towards the end of its initial planned life, a fourth and final Call for Proposals will be issued in July 2012, and this brochure provides an overview of the content and proposed budget for this Call. Looking to the future, and building on the strengths of the PPP approach to organising industry-driven research, the challenge now is to improve and refine the PPPs so that they are no longer components of an Economic Recovery Plan, but instead a programmatic approach towards implementation of research in industries that have strategic importance to the EU economy. Progress towards updating and improving the Multi-annual Roadmaps is also being considered. One of the key challenges in updating the roadmaps is to take account of the circumstances that need to drive research in the future, which include not only continuing economic difficulties, uncertainties and instabilities, but also complex societal challenges such as climate change mitigation, and the continuing development of powerful economies in all regions of the world. These specific challenges represent market opportunities for European enterprises, and the over-arching challenge is how to turn problems into opportunities.

