NEW OPPORTUNITIES FOR THE CLEAN VEHICLE SECTOR IN SPAIN

Document elaborated by the Spanish Automotive and Mobility Technology Platform - M2F (www.move2future.es). For additional information about contents of this document you may contact cecilia.medina@move2future.es

Manuela Soares

Director Transport Research
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Dear members of the Spanish Green Cars Community,

It is a great pleasure for me to welcome you in this foreword to the fifth edition of the Spanish Green Cars annual conference. This conference has to be placed in the context of the progress of the European Green Cars Initiative in the 7th Framework programme towards the proposed European Green Vehicles Initiative, under the new European Research and Innovation Framework Programme-Horizon 2020.

Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness that will run from 2014 to 2020. Horizon 2020 will strengthen the EU's position in science, empower European industrial leadership in innovation and address major societal concerns shared by all Europeans. The development of smart, green and integrated transport will be one of the societal challenges to be tackled with a market-driven approach and with the final goal of creating growth and jobs in Europe.

The European "Green Vehicles" Initiative is a prospective new Public Private Partnership, part of Horizon 2020, the new R&D&I programme still to be approved by the Council and the EP. Following the positive experience of the European "Green Cars" Initiative in FP7 and considering the added value that such initiatives bring at European level, both the industry and the Commission have renewed their commitment towards the greening of surface transport. The European Green Vehicles initiative will focus on energy efficiency and alternative powertrains of vehicles, addressing the whole value chain to deliver innovation from resource application to demonstration.

Former editions of this conference demonstrated, step by step, the evolution of the initiative, from the first presentation of capacities in 2009 to the identification of leadership opportunities and the presentation of running projects' objectives and results. This year's edition focuses on available technologies and market uptake. This is aligned with the Horizon 2020 aim of helping to bridge the gap between research and markets by, for example, helping innovative enterprises develop their technological breakthroughs into viable products with real commercial potential.

Year after year, the conferences have gathered over 200 participants and a growing interest to participate. This interest can also be seen in the recent calls of FP7-Green Cars, where the participation and success rate of the Spanish entities was highly remarkable, in accordance with the great potential and capabilities of its innovation chain in eco- and electro-mobility.

It is also remarkable that this year the conference is held at the venue of the International Electric Vehicle Conference EVS27. This is a widely recognized forum for the electric transport industry where more than 5.000 professionals debate. Debates are about electric, hybrid, plug-in and fuel cell vehicles, showcasing all types of currently available solutions and innovations.
I wish you all a successful participation.

Elisa Robles

Director General of the Centre for the Development of Industrial Technology (CDTI)
Ministry of Economy and Competitiveness

Dear member of the Spanish Green Cars community:

It is a great pleasure to welcome you to our 5th National Workshop on the European Green Cars Initiative. With an intentioned look into the future, this year's edition has added in the title the words "H2020 Green Vehicles", since 2013 has marked the transition from FP7 Green Cars to H2020 Green Vehicles.

The continuation of the initiative for the next seven years confirms that we have been working in the right direction since 2009, when it all began. But it also indicates that a lot more has still to be done if we want to achieve the common goal of seeing the green vehicles predominating in our roads in the next future.

The European Commission will commit around 1,500 million Euros for the period 2014-2020, making the Green Vehicles Initiative one of the most ambitious research and development programmes in the automotive sector in the world. We have to make the most of this budget, developing forefront technologies and boosting European competitiveness and industrial leadership.

Spain wants to continue playing a leading role in the Green Vehicles Initiative, as we did in Green Cars. Now that the latter is finished, we can look back and evaluate the results achieved: Spanish entities are coordinating 13 projects (one out of six) and have awarded more than the 10% of the total budget.

These figures place our country in 4th position in the overall ranking -only after Germany, Italy and France-. Consequently, we can assert that Spain has finally reached the position that we deserve, considering our tradition and capacities as vehicles and components manufacturer.

CDTI has always been, and will be in the future, an active supporter of the Green Cars Initiative. With no doubt we will continue promoting the Spanish participation and endorsing our entities to achieve the common target of equalizing or even improving the results attained so far.

This annual Conference, held this time in Barcelona, gathers the main Spanish actors in the sector and will be the perfect occasion for showing our interest in the Green Vehicles initiative and for building a common roadmap towards the future.

I would like to thank the co-organizers of the event for their endless efforts to organize what I am sure will be a remarkable event: ACCIÓ, Applus IDIADA, M2F and, of course, the members of the Spanish "Green Cars" Support Action consortium (SERNAUTO, ANFAC, Iberdrola and Tecnalia). I also want to express my gratitude to the European Commission, for their major commitment to the Conference.

I wish you a very successful event here in Barcelona and encourage you to persevere in your efforts to take advantage of the many research opportunities within the European Green Vehicles R&D Initiative.

Hon Felip Puig i Godes

Minister for Business and Labour
Government of Catalonia

ACCIÓ

Generalitat de Catalunya

Dear colleague,

It is a great pleasure to welcome you to this 2013 edition of the National Green Cars Conference.

We could say that automotive industry shaped the industry itself during the 20th century. Every industrial country in the World built a strong automotive industry and Catalonia was not (and is not) an exemption. This industry generates some 100,000 jobs (41.000 of them are direct jobs), it has a turnover of 13,000 million euros (10% of the overall industrial turnover in Catalonia), and its exports are worth 7,400 million euros (including OEMs and auto parts), which represents some 60% of its turnover.

Catalonia has a first rate automotive ecosystem that includes, among other things, two OEMs, over 150 TIER 1 companies, a wide range of advanced services and R&D centres and, since this year, an automotive cluster. All these stakeholders are aware of all the changes that are redefining not only the automotive industry but also mobility itself.

We are driving through an exciting road that will lead us to a greener and smarter mobility and U-Turns are not an option for us. The Government of Catalonia is fully committed to this change and a Strategic Programme on Sustainable Mobility is being developed along with the Barcelona City Council and the Metropolitan Area of Barcelona.

In this early stage we are prioritizing our efforts in electric motorbikes, urban and service cars, fleets and new mobility services such as sharing. The reasons are twofold: firstly, these vehicles are the spearhead of the introduction of electric mobility. Secondly, and most importantly, Catalonia has a wide range of competitive industries related to these specific fields.

These capabilities, along with the public and private consensus that electromobility must be enhanced (exemplified by the LIVE Platform, a PPP aiming to impulse and coordinate electromobility initiatives) and the status of Barcelona as a living lab for new technologies and new models of mobility have been key reasons to hold the 27EVS. It is in this framework that this Green Cars Conference is celebrated.

This consensus is based on one objective fact: the automotive industry, and more particularly the advanced vehicle one, has a positive impact on several sectors that just one decade ago where not linked to automobile. This is the case of media (connectivity and multimedia content creation), satellites (georeference) or security. An advanced automotive industry generates growth in many other added value industries and also boosts environmental and social improvement.

The different schemes and initiatives promoted by the European Union over the last years have contributed to strengthen this added value. In this sense, Catalonia has maximized its

opportunities by attracting 2.1% of the total financing available from the Seventh Framework Programme for R&D, although the size of its population as a proportion of that of Europe is some 1.5%. I am sure that the automotive sector will make the most of the future European programmes by making this research utterly market oriented, just as the initiatives (not only Catalans) that you can find in the following pages.

As Minister for Industry and Labour of the Government of Catalonia, it is my pleasure to present this document which sets out the technology and content result of this Green Cars Conference 2013.

Summary

Spanish Contributions and Priorities to the European Green Vehicles Initiative (EGVI)

Spanish Contributions and Priorities to the European Green Vehicles Initiative (EGVI)

Preamble

The purpose of this document is to update the Spanish contributions and priorities to the European Green Cars Initiative (EGCI)[1], adapting them to the new European Green Vehicles Initiative (EGVI) under the new EU Research and Innovation Framework Programme Horizon 2020. Its aim is to translate the interests and needs in research and development of Spanish entities involved in this field, to help medium and long term development of sustainable transport and eco-efficient mobility solutions. It also sets out the strengths of the "value chain" of the Spanish system, in order to achieve a clear positioning within the EGVI framework.

Updating work has been developed within the CDTI Green Vehicles Technical Forum, in which the main Spanish stakeholders of the eco- and electromobility innovation and value chains are represented [industries, research centres and academia in the fields of automotive and road mobility (both light and heavy duty vehicles], energy, logistics, ICT...). The annexes at the end of this document detail the entities involved in the preparation of the preliminary document as well as in this update.

Each priority formerly identified has been reviewed and updated, according to the results of running projects initiated in past years and the new focus of the EGVI and Horizon 2020 pillars.

Since the first FP7 Green Cars calls, launched in 2009, participation of Spanish entities has increased, both quantitatively, in terms of funding and number of participants, and qualitatively, as far as project leadership and involvement in key consortia is concerned.

Since then, Green Cars activities in Spain covered a broad spectrum: CDTI promoted a technical forum, that defined the national roadmap, and funded a support action to foster participation of Spanish entities in the EGCI. Besides the information distribution, the support action focused on the organization of annual national Green Cars events, the identification of the main actors at national level (directory in www.fp7greencars.es) and the compilation of Green Cars projects and products and technologies. The directories were included in four books, linked to the four national events, which were broadly distributed at national and European levels:

1. Spanish Capabilities in the Eco-electro Road Mobility Sector and the FP7 Green Cars Initiative (2009).
2. Green Cars and Leadership Opportunities in Spain (2010).
3. Green Cars Spain 2011: Ongoing Projects (2011).
4. Green Cars 2012: Business Challenges and Global Opportunities (2012).

While former research focus on clean and energy efficient technologies has been strongly and successfully supporting the development and deployment of green cars, as well as it is currently broadening the scope to a larger vehicle concept that sets up a more inclusive approach, also stimulating customers' acceptance in a wider range, it is yet a challenge to the Spanish automotive industrial sector opening a new path to stronger competitiveness and higher productivity rates by means of the internalization of all these new learning into the industrial sector itself. It is the purpose within Horizon 2020 for the Spanish EGVI not only reinforcing Europe´s market position delivering cutting edge products, but also creating a new value chain based on energy efficiency management along the supply chain that definitively pushes and evolves the current understanding of industrial efficiency.

The core of the road transport electrification is the electric vehicle, with electric powertrain and their modules and components. Different car, truck and bus concepts are the main subject of current research and homologation activities, both

1. Spanish contributions and priorities to the European Green Cars Initiative (EGCI), released on 26 November 2009 and reviewed version 09 March 2010.

for urban and road use. Key issues in the development of pure electric vehicles and hybrid vehicles include challenges for the mass production and feasibility of energy storage systems (such as the increase in energy density, capacity, safety, duration, charge-discharge cycles, a higher mechanical and electric standardization and a better communication interface, linked to a cost reduction), cell packaging (especially when dealing with safety, cost, manufacturing, diagnosis, maintenance, repair and recyclability) and the development of architectures for energy management systems and elements exchange and the definition of testing standards. Exploitation of the road and railway network as renewable energies generators can also play a primary contributor to an effective switch to electric mobility.

The development of electric transport systems demands R&D efforts on the whole value chain from the development of components and new high performing materials (energy storage systems, their management and smart integration in the vehicles, drivetrains, energy efficient auxiliaries, energy recovery systems and ICEs for range extenders) and the development and/or adaptation of manufacturing processes to produce them; new vehicle concepts and architectures; the interaction of the vehicle with smart electrical grids and also the integration of electric vehicles in the whole transport system. Full deployment of electric vehicles will also demand taking into account the specific issues related to urban mobility, the validation of vehicles and users' acceptance studies provided by demonstration programmes and field operational tests and, finally, the definition of standards and homologation procedures and tests.

Full deployment of electric vehicles will also demand the availability of the charging infrastructure and its integration in the large scale mobility system. In this context, the concept V2G combines fast charge with smart payment system, ICT for data exchange between the infrastructure and the storage system using standard procedures, physical and logical security of charging points and seamless integration of the charging infrastructure with other Smart Grid developments.

For the long term, road transport will reduce its dependency on, and finally abandon fossil and other non-renewable sources of primary energy. At the same time, the protection of the environment is calling for further reductions of exhaust gas emission (particulates, CO_2,...).

Urban mobility, as specific segment of transport demand calls for specific solutions both for the development, testing and integration of new technologies in electric and hybrid vehicles and their adaptation to the mobility demand of different users, and also for fleet management with new tools for communication vehicle - infrastructure - control centre, that require real time management of large amounts of information and its processing and distribution using optimized communication channels. Other user-oriented aspects are also key, such as improvement of public transport or car pooling among others.

There are some technical complementary aspects between Green Vehicles and Factories of the Future PPPs. In fact, manufacturing and supply chain of the green cars sector could take advantage of the new concepts and technologies developed within FoF: Sustainable manufacturing, ICT enabling intelligent manufacturing, high performance manufacturing and exploiting new materials through manufacturing. All this transversal manufacturing topics could also be developed for the green cars industry. On the other hand, FoF initiative could take advantage of the optimization of the overall transport system through logistics, co-modality and ITS implementation, improving Supply Chain performance.

The EGVI, focusing as it does on electrification of road transport, is complementary to the Hydrogen and Fuel Cell Technology Initiative, launched in 2008. This initiative will implement the EU target-oriented research and development to support the broad market introduction of these technologies. In fact, extensive use of hydrogen as energy driver and catalyst will represent another major contributor to an effective switch to electric mobility. At national level, the short/medium/long-term strategy is coordinated by the Spanish Hydrogen & Fuel Cell Technology Platform (www.ptehpc.org).

Logistics, formerly included in the EGCI, is no longer a priority of the EGVI and for this reason the priorities related to logistics and co-modality which were included in the former document, have not been included in this one. However, it is important to point out the importance of logistics R&D and innovation in terms of contribution to competitiveness and sustainability of industry and also the high level of logistics activities in Spain. HORIZON 2020 R&D and innovation priorities in the field of logistics will be channelled through the future European Technology Platform on Logistics, which is being developed by FP7 Project WINN (www.winn-project.eu). WINN is led by the Spanish Center of Competence in Logistics (CNC-LOGISTICA) which also leads the Spanish Technology Platform on Logistics.

1. Introduction: Spanish strengths

Fulfilment of the ambitious goals set initialy in the Green Cars initiative and later in the EGVI roadmap demands collaboration among all the sectors and technology agents involved: Vehicle manufacturers and their suppliers, utilities, infrastructures and logistics operators and public and private technological centres and research teams.

All those stakeholders contribute to strengthen the Spanish position in the general goal of achieving greener road mobility as follows:

- The size of the Automotive sector: Spain is the 3rd largest European manufacturer of cars and light vehicles and the first in heavy duty and commercial vehicles in Europe, linked to a strong component suppliers sector, that includes around 1,000 companies from large international groups to SMEs and manufactures all types of components and systems.
- One of the Spanish OEM's has the biggest facilities for automotive R+D (with a headcount of about 1000 engineers), leading research in technologies for the future development and manufacturing of PHEV's and BEV's.
- The production of some pure electric vehicles has already been assigned to Spanish OEM plants. Among others, these are good examples of electric vehicles built or to be built in Spain: Citroën Berlingo, Mercedes Benz Vito E-Cell, Nissan eNV200, Peugeot Partner and Renault Twizzy
- Spain, as first EU heavy duty vehicle manufacturer, presents strong HDV power-train R&D capabilities, especially concerning natural gas engines. Moreover the 2nd largest biomethane plant worldwide is in Madrid.
- R&D capabilities of vehicle and component manufacturers is complemented by a network of technological centres and specialized research groups, with broad technical capabilities and experience in national and international RTD projects, customers' support, testing and homologation. The same applies for the ICT sector.
- There is a growing number of Spanish companies and technology centres developing lithium-ion and metal/air (Al, Fe,...) battery technologies for electric vehicles, and in some cases coordinating EU funded projects in this field, as well as a plant assembling lithium batteries for motorcycles and small vehicles (EMIC system) and battery recycling capabilities, currently for lead acid batteries, with lithium ion battery recycling programs under way
- The Spanish Utilities hold a leading position in the European energy market, whereas renewable energies represent a significant ratio in the generation mix in Spain (301 gCO_2/kWh in 2012). Therefore integration of renewable energy sources by means of road transport electrification is a logical strategic energy policy at national level.
- Existence of an ITS and intelligent infrastructures sector capable of combining smart recharging infrastructures with global, integrated and greener mobility schemas.
- Transport activities and the logistics network represent also a key pillar of Spanish economy, which is reflected in the high Spanish participation level in the European Association Europlatforms.
- The National Technology Platforms are meeting points for technological agents within each sector and have already defined their own industrial oriented vision and strategic research agendas. Those directly linked to the EGCI are Move to Future - M2F for the automotive and mobility sectors (www.move2future.es), Futured for smart grids (www.futured.es) and Logistop for logistics (www.logistop.org). The national platforms have already established links with the related or mirror European TPs.
- The Ingenio 2010 Plan launched in June 2005 has provided a significant increase of public funding for RTD projects, specially of large integrated projects, and the set up of strategic public-private consortia, with a impact on the resources devoted to R&D.

The **Automotive Sector** is one of the keystones of the Spanish economy, generating, in 2012, nearly 9% of both the direct and indirect employment of the active workforce and contributing 10% to the GDP. Spanish vehicle production has dropped in 2012 by 16.6%, positioning itself as second largest European vehicle producer and 12th worldwide, with a volume level of a little more than 1.9 million units, accounting for around 30 B€. By the other hand, Spain represents the 5th largest car market in Europe with (699,589 cars/year).

The automotive sector is one of the main exporters in the Spanish economy, since it represents nearly 18% of the total goods exports. Nearly 87% of the vehicle production is for exportation (1.7 million units in 2012), mainly to the European Union. It should be highlighted, however, that the exports to the countries that have recently joined the EU is gradually increasing.

It is also remarkable that the investment levels have managed in 2012 to recover to over 2,000 million Euros, which demonstrates the high confidence that the "parent companies" have in Spanish factories.

Spain, as 1st EU LCV+HDV producer, has major production facilities of HDV and presents strong HDV power-train R&D capabilities especially concerning Natural Gas (NG) engines. Regarding passenger transport vehicles, Spain holds a leading position in the multi-stage vehicle production and has significant examples of R&D projects on alternative power-train technologies (including hybrid and hydrogen) in this sector. Moreover, the advantageous position of Spanish LNG infrastructure and national operators and the biomethane national production provides increasing opportunities in this technology related R&D projects.

Finally, in regards to urban transport and services, Spain has cities (i.e. Madrid, Barcelona, Málaga,...) which must be considered as "EU Champions" in incorporating alternative power-

TOP 5 EU		TOP 15 Worldwide	
1º	Germany	1º	China
2º	Spain	2º	USA
3º	France	3º	Japan
4º	United Kingdom	4º	Germany
5º	Czech Republic	5º	South Korea
		6º	India
		7º	Brazil
		8º	Mexico
		9º	Thailand
		10º	Canada
		11º	Russia
		12º	Spain
		13º	France
		14º	United Kingdom
		15º	Czech Republic

Source: Prepared by ANFAC in accordance with OICA.

train vehicles into their public transport and services systems, and a Netwotk of Smart Cities (RECI, http://www.redciudadesinteligentes.es/) chaired by Santander.

The Spanish **component manufacturers' sector** turnover in 2012 was 27,442 M€, 65% of which were exported. The component manufacturers' sector includes 1,000 companies from SMEs to large international groups. They show a strong innovation capability, with an average R&D investment of 3% related to turnover. In general, 75% of the value of the car and 50% of the R&D spending comes from suppliers.

Spanish automotive suppliers are well aware of the threats and challenges that the highly demanding automotive industry requests through the whole value chain, from TIER 1 to TIER 4. Besides production plants of the main global foreign component manufacturers, there are a few large Spanish companies and a broad network of smaller suppliers, most of them SMEs, who are showing, year by year, their capability to comply with the stringent quality and technical requirements demanded by OEMs and transferred through all the value chain. As requested by OEMs, companies are not only providers to the former level, but real development suppliers.

Competitiveness of the European automotive industry at the upper level of the pyramid will be assured when all the lower levels (TIER 1 to TIER 4) can become development suppliers of the former one. To reach the goals set for a sustainable mobility, meeting the challenges of cleaner, safer and smarter vehicles and transport systems, TIER 1 suppliers must develop new products and systems. However, they cannot do it alone, they need the following levels of the chain to provide them with new components and sub-systems, materials, etc. and work of all of them must be aligned. The sector's priorities must be known and encompassed through all the value chain. For this reason it is important to establish mechanisms for an effective flow of information on both directions, upstream and downstream in the suppliers pyramid, and to support technological collaboration of suppliers from different levels.

There is a need for the development of technologies for the vehicles, but, upon that, there is also a strong need of establishing collaboration models to develop communication systems that lead to a higher efficiency in energy and resources use. Sustainable mobility must be based not only on cleaner and smarter vehicles, but on connected vehicle (V2X) strategies and energy efficiency paradigms in the whole system as well. New development opportunities and technological collaboration agreements are therefore needed, especially with those sectors that are becoming more and more linked to the vehicle in the future: the utilities, infrastructures and ITS suppliers.

The **smart integration of green cars into the electricity grid** requires the development of new coordination and standardisation schemes along all the electricity supply value chain: cars, retailers, distribution companies, resellers, and transmission system operators (TSOs), in order to assure that the infrastructure that fuels these mobility schemes is available not only nation but European-wide, with the same quality, standards and services.

Spain has the suitable electricity sector structure for contributing to meet the green car initiative. In fact, from the electricity infrastructure point of view, one single company is acting as TSO over the whole national territory while two distribution companies cover almost 80% of the area. This would assure that coordination and agreements for nationwide standards can be achieved in shorter terms than other European countries where the number of stakeholders in the sector is greater. Common projects are already ongoing for that purpose. Also, Spanish utilities are leading companies at the European level in contributing to achieve common standards for connection and management of distributed demand resources. It is also worth mentioning the Spanish TSO is the only European TSO having a special unit entirely devoted to demand-side management (DSM).

Liberalised electricity market and open competition among retailers and energy products and services operators, represent a good market place where new mobility solutions can be rolled out to meet present and future user´s needs. Massive development of publicly accessible electrical recharging infrastructure could certainly encourage the development of electromobility but it has to be mainly a MARKET DRIVEN PROCESS. Users will change towards electromobility, mainly when being sure that good price/benefit balance is obtained.

The **Spanish ICT sector** turnover was 85,073 M€ in 2011 and, according to the EITO, Spain is the fifth ICT market by volume in Europe. The ICT macrosector represents, in global terms, a ratio of GDP similar to the automotive sector. Innovation investment (R&D&I) in the ICT sector almost doubled over the period 2003-2009. ICT's investment in R&D accounts for 40% or the total amount invested by the private sector in Spain. This is clearly a strategic sector for Spanish economy: In 2010, there were 29,979 ICT companies operating in Spain that, in 2011, employed 444,680 people. The ICT companies and their technologies are key to sustainable economic growth, a growth that should maintain respect for the environment. ICT technologies contribute to energy savings and their contribution is essential to mitigate greenhouse emissions through a range of technology solutions that improve the efficiency of other sectors, such as e-services, virtualization solutions or ICT for energy-intensive sectors such as electricity and transportation. The application of ICT, in its broadest sense, enables the development of tools that facilitate mobility management and also help increase efficiency throughout the system.

The following priorities have been identified and are described in this document:

1. Materials, manufacturing and processes.
2. Systems and components for electric vehicles.
3. ICEs for light vehicles (range extenders).
4. Heavy duty vehicles: focus on electrification and alternative technologies.
5. ICEs for heavy vehicles.
6. Smart infrastructure and services for Green Vehicles.
7. Grid integration.
8. Sustainable urban mobility: vehicles and concepts.
9. Sustainable urban mobility: connected vehicle and fleets.
10. ICT technologies for the improvement of the whole transport system.
11. Demonstration and field operational tests.
12. Regulation and standards, homologations, tests, validation, safety and type approval of the hybrid and electric vehicles.

2. Research Priorities

2.1. Materials, manufacturing and processes

Objectives and scope

Hybrid and electric vehicle components are going to be massively used as new models in these groups come into market. Step by step, new specifically designed systems and components improve the functionality in a non-stop circle.

From the first generations of industry derived equipment, used in the early electric cars, to today's specifically designed systems an important way has been done. A big range of materials is being increasingly used with better answer to required specifications. However, other questions must be faced, such as the shortage of raw materials, some of them extracted in politically unstable countries (e.g. rare earths). Particular interest for the energy efficiency can be focused on vehicle weight reduction, through use of lightweight materials, improvement of manufacturing processes and assurance of safety standards.

Technological solutions from other fields such as power electronics, renewable energies, composites and nanotechnologies (Spanish strong research fields) may offer significant improvements to the new generation of hybrid and electric vehicle components. In this field we must consider the massive production of nowadays expensive composites through new production concepts which will contribute to enhance the autonomy of new vehicles by reducing total weight.

Major R&D areas

1. **Development and manufacturing of lighter high performance materials** for new definitions of:

- Designing and modelling of vehicle modular architecture, with emphasis on safety, range extending and energy and cost efficiency. New concepts, tools and more accurate simulations.
- Life cycle analysis and environmental sustainability. Recycling, reusing and revalorization of materials at the end of product's useful life cycle (batteries, electric motors...). Development of renewable and alternative materials (i.e. biomaterials; photovoltaic pavement for road, tram and railway) to replace non-renewable ones (fossil origin materials).
- Lifecycle Cost Analysis of cells, components and modules of products (batteries, motors, etc.) in order to assess the cost impacts of green vehicles. It is necessary to work on the compatibility of new and existing materials to ensure lighter components of the vehicle and improving protection in any case (e.g. children).
- High energy absorption and higher properties materials to improve vehicle safety without penalizing weight, including the use of reinforced plastics, carbon and reinforced fibers, produced with automotive standards and cost objectives.
- Lightening and optimization of batteries and electric motors. Reduction of costs and increasing motor specific power. Improvement of mechanical performance.
- Development of new materials for power electronics able to work in high temperature environments to reduce weight and complexity of motors, inverters and batteries.
- New (multi)functional performance materials and components for new vehicles (e.g. sensors, actuators, EM shielding).
- Progress in the implementation of nanotechnologies (nanocomposites, polymeric matrixes...).

2. **Development and implementation of electronic systems embedded in materials** to provide information about their behaviour in real time.
3. **Development of multifunctional materials** to allow their implementation in the vehicle surface and in key vehicle elements.
4. **R&D on new materials for advanced batteries and other energy storage systems** (supercapacitors...) and improvement of those currently used to increase performance (specific energy and power, life cycle, safety, reliability) and reduce cost. Development of the manufacturing processes adapted to the new materials and of new processing routes to manufacture composite electrodes.
5. **Development of new joining technologies** with lower environmental costs, paying special attention to dissimilar joining and enabling easier dismantling and recycling processes.
6. **Metrology applied to manufacturing:** development of measuring and calibration methods, quicker and cheaper, for quality control and manufacturing system verification. Calibration and traceability tests.
7. **Mechatronics and microtechnology:** design, manufacturing and calibration systems and prototypes for manufacturing and contact / no contact high precision measurements.
8. Incorporation of **customization and vehicle adaptation concepts** to finished products, decoration and differentiating elements.
9. **Automation of vehicle and systems production,** reducing human work force and hardworking tasks, and increasing value of human collaboration.
10. **Improvement of the collaboration between different agents of the suppliers' chain. Optimization from a global point of view.** This means:

    - Security and privacy of Know-how.
    - Protection of sensible information.
    - Design of platforms for information exchange.
    - Collaborative learning.
    - Business processes.
      - Further research and new solutions for sustainable logistics knowledge between manufacturing industries and the transport & distribution sector.
      - Development of new methodologies to calculate revenues and benefits in shared transportation.
      - Definition and validation of business models for the entire supply-chain, fully based on the use of co-modality and focusing on the increase of loading factors.
      - Operation and integration of participants setting up basis for an interconnected logistics system for 2030.

11. **Optimization of transport from a supply chain perspective.** Optimization of the entries management and the supply chain planning. Analysing products from the designing phase, taking into account logistic requirements for favouring materials inverse flow, recycling, reusing, remanufacturing and other business processes.

    - Processing of recycled materials reincorporation in production processes.
    - Recycling strategies to compare the relative economic and environmental benefits of the logistical processes implemented.
    - Reversing logistics for waste (including packaging waste).

12. **Packaging logistics optimization**, help policy-makers to create strategies to incentive users of reverse logistics, and help to establish regulations, by decreasing taxes or stimulating innovation, for effectively implement European / National policies on solid waste.
13. **Optimization of current networks of material feedback.** Development of new applications for recycled materials in other functional environments, in which materials fully comply with the end of life regulations. Considering the management of the information and life use of the material from the initial design and manufacturing processes.

Expected impact

- **Improvement of Spanish position in materials and processes own technologies** for future green cars.
    - New quality instruments for new cars (sensors, inspection systems, digital 3D).
    - Development of own technology, technology transfer.
    - Building a new generation of automotive electric engineers.
- **Continuous improvement of productivity and innovation**: development, optimization and automation of techniques and new inspection systems to allow competing in a global market.
- **Reduction of consumption of processing auxiliary systems** (process integration, reduction of intermediate sequences).
- **Reduction of necessary packaging** for ICE and new electric motors.
- **Favourable impact for environment regarding:**
    - Materials reuse (use of biopolymers, plastics recycling and new materials from waste).
    - Reduction of the environmental impact of batteries.
    - Consumption reduction.
    - Emissions reduction.
    - Efficient use of energy.
- **Reduction of the "time to market"** with expert support for the decision taking about OEM suppliers and Tier 1 related to innovative materials performing and related processing technologies.
- **Improvement of electric vehicle safety:**
    - Impacts absorption and materials deformability considering electric environment.
    - Lightweight materials resistance against accidents, and their isolation of electric current.
    - Vulnerable road users' safety.
    - Safety rescue procedures in electric vehicles.
    - Modular and components safety.
- **Translation and use of virtual modelling instruments** related to materials and processes behaviour.

2.2. Systems and components for electric vehicles

Objective and scope

The fully electric propulsion is considered as the most effective concept towards green vehicles. Most of the priorities set for the development of individual components for the electrification of vehicles have been already included in the FP7 EGCI calls. However, the limited market acceptance of the first models that have been launched indicate that further development of vehicle components and systems and their integration in the vehicle are required, while alternative or hybrid solutions continue to deserve consideration.

Major R&D areas

1. **Development of advanced energy storage systems** to comply with the targeted requirements of safety, high energy density and life, linked to low cost and raw material availability and recyclability. Availability of better, cheaper and safer energy storage chemistries and materials represents a key factor for the competitiveness of EVs.
    - Advanced Lithium-ion batteries: Mostly driven by the automotive industry demands, the past few years have seen massive worldwide R&D effort in lithium-ion batteries. Still the main obstacle for market penetration of electric vehicle can be associated with battery cost. Current kWh prices need to be significantly reduced to achieve full economic viability. It is questionable whether this can be achieved by simply upscaling production of the current Li-ion technology.
    - New challenging chemistries: i.e. Li/O_2, Li/S, Na, Metal/air (Al, Fe, ...), Redox flow (ZnBr).
    - R&D efforts all technology levels: from fundamental electrochemistry research on new materials for batteries and supercapacitors (as indicated in section "2.1. Materials, manufacturing and processes"), to the design and set up of advanced lithium ion and post-lithium battery production lines, and the development of cell technologies and smart integration of battery cells into packs or modules and the final integration into the vehicle (hybrid energy/power storage systems) and the grid (fast charge,

monitoring for peak and load levelling when required).
- Study of second life uses of batteries to improve economic potential.
- Development of energy storage systems covering the full range of automotive applications: from 48 V systems to high voltage ones, and from light urban vehicles to public transport and freight delivery vehicles.
- Development of advanced electronics and high power components to monitorize the complete Storage System (from 48V to HV) through the sensing of the different parameters and the smart algorithm.
- Battery module design (cell packs, BMS – charger & thermal management).

2. **Development of Drivetrain components and systems**, optimization of in-vehicle energy efficiency and energy management:

- Standard modularization of powertrain components and flexible assembly.
- Low cost e-motor, specifically for EVs (high efficiency, compact, low weight, high power and high torque, liquid cooled).
- Components for achieving higher specific power and less weight – packaging: electric machines and power electronics, highly integrated motors & controls. New technology and concepts to improve power density in all new power electronics devices. New lighter materials for power dissipation.
- Two level of voltage: medium 48V and high voltage >250V.
- E-motor compact unit design (e-motor gearbox, high IP rate, driver, thermal management).
- Development of energy management systems to manage the complete vehicle energy flow and reduce energy losses & CO_2 emissions.
- Development of energy harvesting systems to recover energy from different sources: thermal, solar, vibration,...
- Increasing plastic content in underhood components and working in higher temperature environments.
- Vehicle technologies for energy efficiency optimisation: brakes, suspension and recuperation technologies, mechanical and thermal energy recovery systems. (Note: this R&D area is also included in section "2.3. ICEs for light vehicles, range extenders").
- Development of electric generators for hybrid propulsion systems (Note: this R&D area is detailed in section "2.3. ICEs for light vehicles, range extenders").
- Integration of ICE range extenders: Energy management strategies aiming at minimizing energy consumption, including information about energy routing capabilities, availability and limitations of power, trip optimization, predicted or real time traffic situation and specific road attributes.
- Development of new concepts of auxiliary systems, such as air conditioning/heating/venting, specially designed for electric vehicles. Procedures for using complementary and comfort devices in low battery situations.
- Further development of technologies and concepts related with electric in-wheel motors.

3. **Safety aspects of electric vehicles**

- Safety measures related to batteries and supercapacitors, from the cells to the packs:

  - Ultra fast power off systems.
  - Fail safe architectures (ASILD for SW and HW).
  - New sensors in the fail safe loop (temperature, voltage, current, etc.).
  - Secure communication with BUS and new node management.
  - Grounding studies.
  - System voltage studies.
  - New materials.
  - New isolating systems.
  - EMC immunity (a new dimension in connecting to the electricity grid).
  - Accidentology studies (new effects and types of failure).
  - Gas discharge / flammability studies.

- Adaptation of passive and active safety systems to the future transport concepts, in particular quadricycles and low-weight vehicles. New ADAS systems for electric vehicles: collision avoidance, intelligent vehicle dynamics and crash mitigation (Note: this R&D area is also included in section "2.10. ICT for the improvement of the whole transport system").
- Safety technology issues related to electric vehicles and their environment – vulnerable road users: systems for making the presence of silent cars more evident in urban settings.
- Pedestrian protection design: new elements to collect information from outside and presentation of this information inside the vehicle.
- Ergonomics concepts in electric vehicles: new architectures building around passengers instead of around a motors and human limits for technological possibilities (flexible vehicle design still being accepted by the user).

- Functional safety and reliability of components and systems. All the concepts, systems and components should meet the new ISO26262 for automotive functional safety.
- Safety issues related to new electric components and high voltage. Proposals to standardize procedures for handling components with risk of electric shock; high voltage power.
- Safety for rescue workers: creating warning systems for rescue workers (beyond eCall) and protocols for security forces in the case of accidents involving electric vehicles.
- Repair and maintenance safety for electric vehicles: Define specific training for all vehicle technicians (auto-body workers, mechanics, auto painters, etc.) taking into account the risks associated with working on electric vehicles.
- Intelligent systems and services for electric vehicles: Defining HMI for onboard information management:

  - New dashboard design as an identifying characteristic for electric vehicles.
  - Study of the relevance of visual, auditory and haptic devices for static electricity generated, consequences and proposed procedures.
  - Study of the relevance of visual, auditory and haptic devices for real time battery charge status (i.e. information about partial charging through regenerative braking).
  - Study of optimal battery operation indicator design (voltage, charge, etc.); batteries that do not work properly should be disconnected from the system without affecting the others parts.
  - Defining and designing adequate sound, haptic and/or auditory devices for information on vehicle behavior.
  - Defining and designing adequate sound, haptic and/or auditory devices for information on real time vehicle status and anticipated status.

- Study of Typical Driving ERRORS (type, frequency, consequences, etc.):

  - Paying attention to the remaining charge of one or several independent batteries instead of watching the road.
  - Acquired habits from driving internal combustion engine vehicles that could be risks for safely driving an electric vehicle.
  - Errors derived from being accustomed to the location of controls in conventional vehicles.

4. In-vehicle system integration

- Development of components and systems for the new vehicle types and topologies. Microprocessors, FPGAs devices and HW/SW designs for E/E and multi-system architectures.
- Integration of nanoelectronic technologies, devices, circuits and power electronics modules.
- Functional architecture: position and standardization of interfaces for power and data, distributed x-by-wire systems.
- Development of new architecture concepts taking into account the new 48V trend for intermediate power systems.
- Mid-range EV battery range extender architecture.
- Development of a distributed real time embedded system platform and embedded systems architectures (hardware, software, operating systems, algorithms, etc.), considering safety critical issues and designed with standardised and interoperable components.
- Control methods and strategies related to different architectures.
- Standardisation, interoperability, and interoperability analysis and verification.
- Hybrid retrofit kits for aftermarket (electric, flywheel, thermoelectric)

5. Integration with the electrical network: Vehicle-to-Grid connection

- In-vehicle components for advanced vehicle to grid (V2G) interface. Vehicle charging systems with on-line information and interoperability and bidirectional capabilities.
- Defining safety protocols for charging electric vehicles with different architectures.

6. Integration of EVs with the transport system:

- Cooperative systems vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I), connected cars to improve safety and efficiency, road and traffic information, car-in traffic control systems, communications and infotainment.
- Electric city cars.

Expected impact

- Work on the priorities detailed above will support the medium-long term introduction of Spanish technologies related with green vehicles.
- Full deployment of electric vehicles demands availability in due time and at affordable prices of technologies and components for the vehicle itself as well as for its integration with the electrical grid and with the transport system. This can be accomplished by joint work of all the levels of component suppliers, together with vehicle manufacturers, utilities and infrastructure operators.

2.3. ICEs for light vehicles (range extenders)

Objectives and scope

To promote Research and Development in the propulsion systems for light automotive vehicles in the areas in which the Spanish industry has industrial production capabilities:

- Development / adaptation of thermal – electric engines for auxiliary power units and range extenders of electric / hybrid vehicles.
- Alternative fuels: biofuels, biogas (bio-methane), natural gas.

As a means to fulfil this objective it is necessary to establish working groups and installations specialised in Research and Development for the adaptation of the thermal and electric engine and of the additional systems required (electric energy converters, regulation and control systems, energy recovery and optimisation), as well as for performance optimisation for use with alternative fuels and Spanish manufactured biofuels.

Major R&D areas

1. **Development of small internal combustion engines** of high specific power, ecologic, efficient and quiet, specifically designed as range extenders to increase the autonomy and feed the auxiliary systems of electric vehicles. R&D needs include:

- Engine Downsizing, Downspeeding, Turbocharging.
- Assessing the potential of increasing the ICE degrees of freedom: Fully flexible injection systems, variable valve timing, variable compression ratio, variable engine displacement.
- Exploring the potential of two-stroke engines due to their high specific power.
- Reduction of energy losses in the various engine systems (heat losses, mechanical losses...), through development of new more efficient transmissions, optimized lubrication systems, and integral cooling system for thermal-electric engine.
- Investigation for using reduction gearboxes to couple the electric generator. Trade-offs for weight, cost and efficiency.
- Recovery of waste energy (exhaust, cooling).
- Efficient management and integral control of the internal combustion engine, electric generator, auxiliary systems and transmission.
- System cost optimization.

2. **Development of electric generators** for hybrid propulsion systems:

- Optimisation of the mechanical and thermal design.
- Control of the thermal engine – electric generator system.
- Common energy flow management.

3. **Strategies for engine management and use of different fuels:**

- Development of management strategies for engine and range extenders including both powertrain and external information to minimise fuel consumption and emissions during real driving conditions.
- Multiobjective model based control of the powertrain, reducing calibration efforts and seeking optimal behaviour.
- Adaptation of thermal engines for the use of fuels with different properties with optimal behaviour and proper diagnosis capabilities. LNG/LPG ICE range extender design.
- Development of lubricants suitable for alternative fuels.

4. **Development of alternative fuels**

- 2nd generation biofuels.
- On-board storage systems for alternative fuels.

Expected impact

- Development of the Spanish industry by specialising the existing industry which is nowadays manufacturing stationary and small motorcycle engines. As the range extenders require medium range mechanical and electrical power, they are within reach of the Spanish industry. This development could be extended to hybrid vehicles with higher requirements.
- Development of the Spanish industry of electrical systems and components: generator, electric energy converters, control systems, etc.
- Development of the Spanish biofuel and lubricant manufacturing industry.
- Reduction of the impact on the environment by use of renewable fuels.

2.4. Heavy Duty Vehicles: focus on electrification and alternative technologies

Objectives and scope

The shrinking availability of fossil energy sources requires, in the short to medium term, strongly increasing the energy efficiency of vehicles and of the traffic and transport system as a whole, including Medium and Heavy Duty Vehicles (MDV & HDV).

Maintaining Spanish leading industrial position and leveraging our R&D capabilities in the Medium and Heavy Duty Vehicle industry appear then as major objectives in the framework of the Green Vehicles initiative at national level.

Major R&D areas

1. **Renewable/alternative fuels and related drivetrains** for HDV. Further research related to the energy and environment topic is aiming at the diversification of energy sources and at finding the optimum combination of drive train and energy carrier. R&D needs include:

    - Development of CO_2-neutral fuels from renewable materials, particularly biogas/biomethane, first and second generation bioethanol, hydrogen and electricity.
    - Development of on-board storage systems for alternative fuels.
    - Optimisation of powertrains for alternative fuels: diesel for 2nd generation and CNG/biomethane and dual-fuel combustion.
    - Development of HDV for medium and long distance transport based on LNG (Spain receives 70% of NG in liquid form and saving in running cost accounts for 50%).
    - Development of hybrid thermo-hydraulic powertrains for urban service vehicles applications.
    - Assessment of climate and energy impact:

        - Well-to-wheel analysis for various fuel options and drive trains.
        - Simulation packages for CO_2 indicators of various types of commercial vehicles and for air quality indicators in urban areas taking into account climate conditions.

2. **Technological innovations of the internal combustion engine and exhaust systems** are important short-term paths towards fuel savings. This topic is fully developed under 2.5. below.

3. **Electrification of the vehicle**. Due to their zero local and potentially minor greenhouse gas emissions, electric propulsion and drive trains combining alternative technologies (hybrid, plug-in, electric drive, hydrogen and fuel cell) will play a certain role in reducing the impact of transport on energy consumption, climate and environment also for HDV (although less important than in passenger car). Some R&D possibilities are seen in:

    - Development of hybrid thermo-hydraulic powertrains for urban service vehicles applications.
    - Extending hybrid thermo-electric (including plug-in) developments from passenger cars to M & HDV used in urban distribution and passenger transportation. This leads to extend to M & HDV research initiatives in the following fields: Energy storage systems, new vehicle concepts required for electric propulsion technologies, e.g. using in-wheel motors; solutions for electric vehicle integration issues, thermal management of electric and hybrid vehicles, key components for hybrid, electrical drive and fuel cell systems, etc.

Expected impact

- Maintaining Spanish leading industrial position and leveraging R&D capabilities in the Medium and Heavy Duty Vehicle industry. This will help to keep actual labour force and possibly enhance technical/specialist human resources in Spain.
- Identify Spain as a UE reference in R&D projects and initiatives based on NG (particularly LNG) in the powertrain systems for M & HDV (medium and long distance transport).
- Realizing real applications of hybrid thermo-electric (including plug-in) developments from passenger cars in M & HDV used in urban distribution and passenger transportation.
- Consolidate Spanish municipalities in a leading position in Europe in incorporating alternative powertrain vehicles into their public transport and services systems. Sustainable urban transport in Spain to be a mature reality in the short term.
- Renewable/alternative fuels and related drivetrains for HDV in the multi-stage busses and trucks industry to be recognize as "European champions".
- Development of the Spanish industry of buses and trucks by specialising the existing industry which has experience in the adaptation to natural gas and GLP use.

2.5. ICEs for heavy vehicles

Objectives and scope

To promote Research and Development in the propulsion systems for Heavy Duty automotive vehicles in the areas in which the Spanish industry has industrial production capabilities:

- Improving energy efficiency and reducing emissions of internal combustion engines for HDVs by introducing new combustion concepts, energy recovery, aftertreatment systems and control strategies.
- Reinforcing the use of alternative fuels: biofuels, biogas (bio-methane), natural gas, including LNG.

- Development / conversion of great amount of European Diesel engine for commercial vehicle fleet to "Dual-fuel vehicle", in order to reduce CO_2 gaseous emissions and Diesel Particle Matter generation.

Major R&D areas

Technological innovations of the internal combustion engine and exhaust systems are important short-term paths towards fuel savings. R&D needs are seen in:

1. **Further improvement of conventional powertrains** which involve three main areas:
    - High-efficient combustion engine technologies allowing significant reduction of CO_2 (downsizing, downspeeding, advanced air charging technologies).
    - Flexi-fuel engines allowing to employ different kinds of fuel with optimal behaviour (fuel injection systems, after-treatment and engine control).
    - Energy recovery including Rankine cycles, turbo-compounding or thermoelectric systems.
2. **Optimisation of the vehicle** regarding energy management, energy recuperation, lightweight structures (high-strength steel, aluminium, plastics, compound materials).

Expected impact

Maintaining Spanish leading industrial position and leveraging R&D capabilities in ICEs for Medium and Heavy Duty Vehicles. This will help to keep actual labour force and possibly enhance technical/specialist human resources in Spain.

2.6. Smart infrastructure and services for Green Vehicles

Objectives and scope

Smart grids is a network of networks whose overall objective shall be the integration of all the stakeholders in the electricity networks and communications fields with the transport system, so that the overall use of energy is reduced considering these different stakeholders (vehicles, heavy duty, buses and motorbikes)

Spain has a great potential in the area of integrating vehicle with road infrastructure, based on these main issues:

- *Infrastructure (road and electricity),* improving its value creating a road network able to integrate and develop new business and adding value to the road infrastructure itself. Civil infrastructure companies, with a great projection and potential at the European level, shall take a special leadership in this objective, together with generation, distribution and service provider companies, especially from renewable energy sources in which Spain disposes one of the world greatest potential; which are key issues in this new scenario in which infrastructure can take a leader role, even ahead of vehicles.
- ***Communication and Services,*** sector with great capabilities at the national level, linked to services related to electric vehicles and users. By integrating these capabilities together with infrastructure developers, specific solutions can be obtained by improving services offered to final users and optimising the distribution, charging, safety and security of infrastructure linked to electric vehicles.
- ***Transport***, with R&D solutions for the OEM using different technologies allowing the communication with infrastructures and the network, guaranteeing a real time, seamless bidirectional information exchange and secure transactions. Technologies enable the integration of public, personal and freight transportation.

Major R&D areas

1. **"Smart charging":** control architectures, load balancing and planning, standardisation of operation modes, hardware and software for settlement and payment, algorithms and SW operation (network – vehicle) and integration with existing DMS, physical and logical security. Standardisation and compatibility of operation modes.
2. **Forecast and Adaptive algorithms** (PHEV/EV) Complex range estimator strategies to increase accuracy of range prediction, e.g. based on GPS data, driver behaviour and external data from the infrastructure or other vehicles via ICT/ITS.
3. **Communication services** with protocols both plugged (BUS / PLC), and wireless (DSRC, Wimax, Zigbee, GPRS/3G/LTE, Tetra), with particular emphasis on ensuring interoperability. Bidirectional communications capabilities and interoperability.
4. **Urban infrastructure management:**
    - Urban policy for electrical vehicle management such as environmental areas definition, pricing, charging stations localization. Technologies and ICT solutions for sustainable urban management.
    - Standardisation of traffic prioritisation and "electric" transportation (specific lanes, dedicated lanes, freight – last mile-, public transportation, etc.).
    - ICT solutions for vehicle identification and access control to "green" areas. Sensor networks for

incidents management towards sustainable smart cities.

- Use of nomadic devices in charging stations localization, customer and vehicle identification, Integration with the global traffic management systems.
- User services: driving using dedicated lanes, quick lane or exclusive lane, payment of parking fees in blue or green zones, covered parking places, and ICT solutions for the management of these services and global EV services interoperability.

5. **Fast charging** and charging system integrated in the infrastructure. In particular charging points using existing infrastructure available (petrol stations). Promotion of charging from renewable energy sources.
6. **Integration of alternative energy sources and green vehicles** (storage, distribution). Development of Vehicle to grid (V2G) strategies in order to allow new services of alternative energy distribution in urban areas by making use of the batteries of the electric vehicles as energy buffers: charged in alternative energy peak production hours and discharged in urban environments charging points in order to balance the usage of non-renewable energy.
7. **Safety improvement** (compatibility, crashing in junctions, etc...), warnings of emergency vehicles approaching, emergency or support calls, driver support services, etc...). Notification to local authorities regarding events, alarms. Management of these events. Developments based in current standards and regulations and helping to redefine future normative along with policy makers and standardization bodies.
8. **Added value services for the EV**: management of car-sharing (sharing of EV) solutions (localization, metering etc.), management of private / public EV fleets, telematics services for the EV (Location Based Services, ICT-based Insurance, use of EV as traffic probes, ICT-based parking management etc.), specific navigation solutions (showing recharge points), information regarding CFP of different transport modes. Remote Monitoring of charge progress. Search for closest charge point. Integration of information from traffic, weather forecast, etc.
9. **Developing test sites and proving grounds** with cutting edge testing techniques and tools in order to pretest electric vehicle and infrastructure developments prior to public road pilot projects. Validation and certification of technologies by component and component integrated in order to evaluate and assess potential risks and benefits.
10. **Launching of pilot projects**

    - Able to evaluate technologies developed in **different real life scenarios.**
    - Able to evaluate technologies developed with simulation of **different network scenarios.**

11. **Bidirectional Energy flow between the EV and the Grid.** Technologies V2G. Feasibility Study (business models and cost-benefit analysis). Definition of the charging points functionalities to support the bidirectionality of charging – discharging of EV.

Expected impact

- The impact is clear in environmental terms if pollutant primary energy sources are substituted by cleaner and efficient ones. It is of special interest to fulfil the described objectives, in order to have an efficient intelligent network integrated with the sufficient capability to distribute and supply the necessary energy for charging.
- The position of Spanish companies with greater potential (construction companies, generation and distribution companies, communication and services) as main players in the transport of people and goods, such as the development of physical connections between vehicle, infrastructure (charging points) and electricity network, and the deployment and exploitation of new services based on specific technologies (V2X) and convergent technologies (advanced driver assistance systems - ADAS).
- Fluent and effective charge management including reservation, queue analysis, energy monitoring.

2.7. Grid integration

Objectives and scope

Electrical vehicles represent a new type of demand in the value chain of the electricity sector, which, in accordance with the development previsions, will constitute a considerable percentage of energy and power demands on the electrical system in the coming decades. In addition, the impact on the electricity sector is not well known as the patterns of use of electric vehicles are dependent on the technological options available and their social acceptance. It is worth mentioning that electric vehicles are mobile units which in the future will create different electrical demand scenarios from a geographical point of view.

Strategies for fostering electrical mobility lie in the search of an efficient overall energy system. Because of this, it is not only important to pay attention to the efficiency of the design of the vehicles, but also to the operability of these loads according to the needs of the electrical systems. Therefore, it is fundamental that the latter is considered in the strategic development of the infrastructures.

In this area, the objective to be covered is to continue in the search for the standardization of the physical connection of the vehicles to the grid, aiming at defining European standards for the interoperability of the vehicles in the different distribution networks. In addition, with the objective of achieving an efficient integration into the energy system, infrastructures need to allow for intelligent management of the electric vehicles (identification, charging, payment, operation services, V2G).

Major R&D Areas

Among relevant aspects to cover for an efficient integration of electric vehicles into the grid, the following can be outlined:

1. **Development of European standards for charging** electric vehicles. Despite the achieved advances in the standardization of vehicles physical connection, progress is expected in the standardization of interoperability. Identification of different "Charge Management Strategies". Standardisation.
2. **Implementation of new models** for planning and operating the electricity networks, taking into account the new energy demands. These new models should be an evolution of the current ones considering the roll out of electric vehicles. System simulation and tools.
3. **Development of a regulatory and rating framework** which permits future users of electric vehicles to receive adequate quotes for an efficient use of vehicles, promoting charging during off-peak hours.
4. **Development of new forecast models** for predicting future electricity demand. The DSOs need new tools for planning. Since expanding the grid is slow progress and have significant financial impact, it is important to reinforce it when needed and at critical points in the grid. In this way the capacity of the grid will increase as the EV penetration rises. Impact analysis of large scale integration in the grid with special attention to potential concentration zones in cities (city town, malls, etc.).
5. **Harmonious design of monitoring and real time control and management systems,** which allow the use of the charging stations irrespectively to the distribution networks in which the electric vehicles are connected.
6. **Optimal use of the existing infrastructure** for an intelligent management of electric vehicles. Profiting from telematic networks for metering and customer telemanagement.
7. **Identification of new potential applications and services** of electric vehicles (i.e. V2H, use of the car battery to supply home services).
8. **Identification of business models**. Identification of new roles and business models according to the European deployment regarding smart grids. Cooperation of OEM´s, utilities and other operators can speed up the development of new business models.
9. **Promotion of the use of green electricity as energy supply to the EV and integration of renewable energy into the grid.** Identification of services and synergies that allow electric vehicles charging flexibility to maximise intermittent renewable integration into the system.

Expected impact

- The anticipated results are the achievement of European standards for connection, payment, monitoring and management of the charging of electrical vehicles, so that energy benefits may be achieved.
- Coordinated evolution between the electric vehicles roll out and the electric system.

2.8. Sustainable urban mobility: vehicles and concepts

Objectives and scope

Urban mobility is a segment of transport demand that shows significant differences with the interurban and that calls for specific solutions in the field of the European initiative "Green Cars". Specific issues include:

- Greater significance of local emissions.
- The possibility of using private vehicles with very low emissions as a result of less demanding specific performance.
- The offer of public transport, structured in vehicle fleets of different sizes, can implement strategies and technologies of exploitation and optimization that are not applicable or more difficult to apply in other domains.
- The possibility to deploy ICT supported integrated multimodal mobility schemas which provide greener, seamless transport solutions to citizens.
- The development and field test in early stages of implementation of new concepts and technologies can be facilitated under a more professional management of fleets and companies involved.
- The existing huge frame for the incorporation of new innovative solutions.

Among the principal technological objectives to achieve sustainable and accessible urban mobility of people and goods are the development, testing and integration, in electric and hybrid vehicles platforms, of a set of technologies associated with these vehicles, new fuels generation, electricity supply, energy storage systems, more efficient.

Currently, the interest of companies and public authorities, both national and international, focuses on electric and hybrid vehicles, both sharing a large number of technologies, including those relating to electrical energy storage with batteries that combine the best possible high energy density, short recharge times, reduced weight and number of charge cycles without suffering damage. These requirements are difficult to fulfil all together with existing technologies, hence the interest to tackle projects that would achieve significant progress in several of the identified areas.

The vehicles must enable greater adaptation to the demand for mobility of different users, including reduced mobility persons and goods, especially, urban logistics distribution and collection of urban solid waste.

Major R&D Areas

1. **Smart cities green mobility design and concept.** New concepts and technologies for urban vehicles, electric and hybrid, both for private individuals and public transportation, freight logistics distribution, solid waste and others.
2. **Advanced systems of electrical energy storage in the urban area**, refuelling points, design of the distribution network in urban areas, rapid recharging, battery swapping, vehicle sharing.
3. **New services for sustainable urban mobility**:
    - Environmental indicators evaluation (CO_2 emission) and policy impact analysis.
    - Transport management (demand management systems for urban transport, interoperability for public transport, dynamic charge for services and infrastructure utilization.
4. **Advanced ICT supported integrated multimodal mobility schemas** which provide greener, seamless transport solutions to citizens.
5. **Appropriate ICT systems** to manage and exploit all the information generated, and to integrate it in a non-disruptive way with existing IT infrastructure and applications

Expected impact

The additions of new operating systems and vehicles for urban transport offer have different effects:

- Significant reduction of local emissions, with the reduction at the same time of greenhouse gases emissions and the positive effects that such a reduction involves the health and quality of life of citizens.
- Increased use of private vehicles with ultra-low emissions.
- Increased user accessibility to transportation.
- Contribution to strengthening the leadership position of European industry in addressing future demands for sustainable urban transport and accessible.
- Smooth, consistent integration of the green cars within the overall mobility system of European cities.

2.9. ITS - Sustainable urban mobility: connected vehicle and fleets

Objectives and Scope

Sustainable urban mobility is a key factor for the development of the new transport system, as stated in the Transport European Strategy Plan 2050 – Roadmap to a Single European Transport Area. Special attention is drawn to sustainable driving promotion and integrated urban mobility.

In point 2.8. general objectives and scope of sustainable urban mobility are included. Here, we can find specific items regarding services in future urban mobility, i.e. fleet management and information and communication systems needed to achieve urban transport of people and goods more efficiently, environmentally friendly and accessible to all users. On top of the R&D included here it is worth pointing out the relationships of this research line with "2.6. Smart infrastructure and services for Green Vehicles". Interesting R&D areas are highly relevant in the field of Sustainable Urban Mobility, such as traffic prioritisation, dedicated lanes management, car-sharing and car-pooling solutions, ICT-based parking management including parking slots and information for users are already mentioned; and the development of a framework for urban mobility plans, management of urban access restrictions and real-time traffic prediction.

Fleet management, with new demands arising from the type of vehicle and type of energy, requires new tools for vehicle - infrastructure - control centre communication. All these demands require real-time management of large amounts of information from different actors in the system: clients, infrastructure, vehicles and operators, as well as its processing and distribution using optimized and reliable communication channels.

Major R&D areas

1. **Smart mobility systems**, including new Intelligent Transport Systems, next generation of traffic management and information systems, and integration of urban mobility into smart cities models.

2. **Advanced communication systems and fleet management**, enabling efficient use of vehicles from the energy consumption point of view, while providing at the same time good service quality to the users, with seamless accessibility:

    - Travel information and new driver support systems will be needed to optimize routing and remote management.
    - Intelligent infrastructures will ensure maximum monitoring and communications interoperability between infrastructure and vehicles.
    - Use of communications standards (e.g. short range communications standards elaborated by ETSI and CER).

3. **Implementation of new concepts in mobility** resulting from the introduction of electric vehicles and of the alternative fuel green vehicles.

    - Most trips in the middle term will be multimodal, with one or more segments of the trip being made on electric vehicles. Advanced ITS will be required in order to make this option technically feasible and user-friendly. Nomadic devices will contribute to flexibility and rapid evolution.
    - Inclusion in the mobility patterns of new factors as well as modification of conditions implied by the introduction of the electric vehicle: routes, range, charges, loading and unloading of goods, vehicle sharing, parking slots, etc.
    - New concepts of urban freight distribution (e.g. distribution systems, last mile, dedicated lines for freight transport) and their management.

4. **Improving mobility in the current scenario:**

    - Defining strategic network, transport network design, considering transfers, access and waiting times.
    - Creation of industrial clusters with origins and / or destinations matching to optimize the transport mode used.
    - Design of distribution infrastructure associated with the capillary characteristics (city-logistics) with special focus on Urban Platforms at the neighbourhood level, urban freight distribution design in cities, infrastructure design.
    - Modelling of distribution networks to optimize the overall cost of operations. Optimization of delivery routes based on efficiency and sustainability criteria. Management control centres integration.
    - Solutions for the operation of the distribution and delivery logistics in support of electronic commerce (B2V and B2B), especially on specialized platforms and problems of the last mile scenario.
    - ITS Applications to transform the cities into cooperative environments with integrated mobility management (people and goods) as developed in line 2.3.3.
    - Allocation and network optimization and dynamic urban routes from real-time information, and use of flexible and proactive urban traffic control and prediction strategies.
    - Design / impact measures (urban tolls, fees pk., etc.): modeling and forecasting demand, factors for evaluating actions and scenarios, mobility solutions for peak traffic centres.
    - Advanced system for coordinating emergency operations by priority vehicles (emergency management)
    - Definition of business cases associated to the R&D areas already mentioned.

5. **Promoting the use of public transportation**:

    - Perceptions, motivations, attitudes and expectations and other factors that may incentive the users to use public transport.
    - New tools to provide an accessible, integrated way of measuring the whole journey experience.
    - Actions to improve service reliability, increase travel comfort, select routes faster, and in general driving public transport measures and policies.
    - New traffic management and public transport planning based on differentiated travel information for different user profiles and demand models.
    - Advanced models of intermodal planning for recommending itineraries, integrating all modes of transport (including sustainable means of transport: walking, cycling, car-sharing, etc).

6. **Urban reverse logistics (materials inbound instead of people outbound):**

    - Promotion of public transport and other ways of sustainable transport will demand for an increasing flow of materials where goods get closer to downtown population in larger amounts, instead of people driving away.
    - Operations in a Free of Noise environment will permit working hours during the night for replenishment operations by reaching city hub centres taking advantage of existing railway and underground infrastructure, reducing truck transit during day and night. Urban goods distribution: Last Mile Solutions.

- Promotion of electric vehicles, bicycles and motorbikes for delivery of goods and passenger transport in urban areas.

Expected impact

Besides expected impact included in point 2.2.6, a new generation of services is expected as well as the optimization of current performances by increasing the use of public transport, improving fleet management and freight transport, and promoting mobility integration within the smart city.

2.10. ICT technologies for the improvement of the whole transport system

Objectives and Scope

ICT technologies will play a major role in the research and development of future generations of clean vehicles. The new developments based on ICT will broaden the range of applications and key systems for a safer, cleaner and smarter sustainable mobility. Particularly, the Multiannual Roadmap for the Contractual PPP "European Green Vehicles Initiative", draft version for Stakeholders Consultancy, in preparation for its implementation in **Horizon 2020**, shows the concerns about ITS for energy efficiency, safety and security of data and the integration of green vehicles in the transport system, not only passenger vehicles but also buses and trucks.

In this sense, vehicle-to-vehicle and vehicle-to-infrastructure communication systems and new sensoring technologies allow:

- The **integration** of clean vehicles within the mobility management systems.
- To improve **active safety** applications.
- To encourage the uptake of **electric vehicles** and the development of electromobility business processes and advanced components based on ICT technologies applied to both vehicle and network.
- To enhance new models of flexible **traffic management**
- To facilitate mobility of people and goods, where **comodality** plays a key role, in order to ensure the required levels of safety and energy efficiency, as well as increasing its level of acceptance and market penetration rate.

Major R&D areas

The following areas are considered of special interest by the Spanish entities:

1. **New Intelligent Transportation Systems (ITS) based on ICT technologies** to provide advanced solutions for sustainable mobility in urban and interurban areas, introducing the use of EV as a new element in the transportation network.
2. **Advanced HMI concepts** (Human Machine Interface) which optimize the interaction between the end-user and the eco-efficient multi-modal transport models, including specific HMI for electric vehicles. Nomadic devices play an important role due to their current diffusion.
3. **V2X communication technologies** (vehicle-to-vehicle, vehicle-to-infrastructure, and vehicle-to-grid) and cooperative systems/services applied to efficient and safe mobility. Vehicle and infrastructure as sources of information.
4. **New ADAS (Advanced Driver Assistance Systems) and active safety systems specific for the electric vehicle.**
5. **New concepts of autonomous driving applied to public transport vehicles**, or adapted to fleets with its own special characteristics.
6. **Interoperability, communication protocols standardisation and data communication interfaces**, including data transmission to feed the models of demand management as well as supplying the EV users with advanced infotainment services.
7. **Applications encouraging sustainable behaviour**, enhancing eco-driving, travel information exploitation and new mobility models as car-sharing.
8. **Development of advanced concepts of mobility of people and goods,** co-modality and accessibility.
9. **Services providing information** to goods sharing, traffic situation, intelligent cargo, CFP, security and safety, SLA compliance.
10. **ICT for advanced and eco-efficient logistic applications**. Transportation solutions for goods multimodality, adjustment of demand and offer on power grids, pricing of energy, park reservation for freight transport, route planning and re-planning based on orders, incident management and delivery process progress; widespread distribution logistics models (congestion, access and time restrictions, etc.), decision support system to choose routes and transport modes in urban areas.
11. **New control and traffic management models** oriented to energy efficiency (accessible, ubiquitous and reliable real time traffic information, eco-routing/eco-navigation, etc.), infrastructure management (parking integration, charging stations, public transport and fleets monitoring...), toll collection systems (e.g. based on discrimination between GC and other vehicles), behaviour motivation (e.g. by fines or allowing access to restricted zones), systems to make decisions about future infrastructures.
12. **Impact assessment**: emissions and consumption reductions, energy efficiency, transport efficiency, traffic congestion reduction, road safety improvement, etc.

13. **Implementation of Galileo**. Enhancement of navigation and positioning performance which may allow a step beyond current applications based on the use of GNSS, be an alternative to other technologies currently used for different mobility applications or facilitate the introduction of applications not possible with current GNSS technology.
14. **Security and privacy in ICT**. Provision of services with a high level of security in the communications between vehicle and infrastructure, with a high respect for the user privacy.

Expected impact

- Introduction of new products and services based on ICT that will actively contribute to the deployment of electric cars and the implementation of new models for sustainable mobility.
- Contribution of the ICT technologies to the optimization of the logistic chains and urban mobility.
- Improved shared information with less bureaucracy.
- Encouraging interoperability based on ICT technologies and standardisation.
- Implementation of real time decision systems in mobility.
- Introduction of new navigation facilities, required in order to validate the drivers itinerary, driving speed, power consumption due to new constrains in the mobility of people introduced by Electric vehicles (the sparse availability of electric power station in the early stages of EV shift together with the limited energy storage capability of vehicles)
- From an energy efficiency standpoint, improved vehicles itineraries with onboard navigation systems able to integrate real time traffic information (e.g. parking areas availability, traffic congestion, road status...). One way to accomplish this without heavy and costly investments in infrastructures equipments is to add sensing capabilities to the vehicle itself and use the captured information to build and share a real-time snapshot of traffic conditions.

2.11. Demonstration and field operational tests

Objectives and scope

The development of technologies linked to the electric vehicles requires the existence of large scale demonstrations, aimed at validating said technologies. These demonstration projects need to have a global scope so that not only are individual technologies validated in the areas of vehicles, infrastructure, communications and energy supply, but also to validate how these different technologies are integrated in order to obtain synergies that lead to better efficiencies, lower costs, CO_2 emissions... FOTs provide unique opportunities to test in real scenarios those developments that cannot be performed by simulation or closed proving grounds. They are especially suitable for those use cases where road users need to be in the loop, both public and private, and also are very interesting as mechanisms to promote the use of the EV into our roads and help to disseminate its benefits into society, finally the integration in the transport system and the implementation of electromobility services are also important issues to e tested and demonstrated. Moreover, FOTs will contribute to the development of optimal solutions to the barriers currently inhibiting uptake of EVs in the sector, including best practice advice on EV in logistics for: policy makers, logistics operators and drivers.

The scenario for these demonstrations should be urban and suburban areas. The implementation of these demonstrations will be done using commercial vehicles, public transportation, delivery vehicles, etc. Also, all systems implemented should be analyzed (communications, electricity, etc.) as well as the degree of users' acceptance, with the aim of identifying appropriate policies for a better future use. ICT technologies prove to be fundamental in the near future in order to demonstrate the benefits of ITS solutions for the EV penetration and providing advanced services in order to achieve optimal energy efficiency and comprehensive management tools both from the road user and the road operator point of view.

Major R&D Areas

R&D needs are related to the integration of existing technologies and new developments permitting the efficient, secure and reliable connection among the different elements integrating the system.

1. **Vehicles (private cars and motorbikes, public and freight transport)**

    - Study of different vehicle concepts, according to their use (urban, suburban, goods transport, etc.).
    - Analysis and evaluation of fleets (taxi, delivery, etc.).
    - Analysis of the systems implemented in the vehicles and users' review and analysis (Motors: in-wheels vs. stand-alone; Traction and stability control; Battery; Inverters-Converters; etc.).
    - Analysis of charging systems in vehicles (fixed battery, battery change, et.).
    - Analysis of charging technologies (Conductive vs. Inductive).
    - Testing crash performance of EV and their components (Battery packs).

- Impact of great number of information in the economy of the vehicle.
- Impact of electric vehicles uptake and specific systems performance.

2. **Infrastructure: road, electric** (generation, distribution and charging), **communications** (vehicle to infrastructure and infrastructure to vehicle):

    - Ensuring interoperability and mobility of future EV: Authentication and Authorization; Payment in Roaming; etc.
    - Way the information is presented: location of charging points, traffic conditions, road mapping, associated/added services, etc.
    - Adequate technologies for information exchange: system – vehicle, vehicle –vehicle; Vehicle-user. Use of Dedicated Short Range Communications (DSRC) standardized by ETSI and CEN.
    - Influence of infrastructure on information saturation.
    - Services and user data security.
    - Integration of the green vehicles into the overall mobility schemas of the road network. Synergic management of the energy related aspects and the traffic/ travellers related aspects.
    - ICT solutions applied to the Availability of reserved Loading/Unloading (L/U) areas near the next delivery/collection point and the availability of charging points.
    - ITS for managing mobility, transport of goods, public transport and user information.
    - Charging:

        - AC vs. DC charging.
        - Fast and ultrafast charging.
        - Connectors (combo vs. ChaDeMo).

3. **Analysis of new energy generation systems** implemented in vehicles as well as distributed along road infrastructures.

    - Energy harvesting and generation.

4. **Establishment of regulations for the use of infrastructure,** with particular emphasis on interoperability in communications and charging systems.

Expected impact

- Use of Spanish technology in the demonstrations, allowing Spanish companies to validate their technologies and developments at an individual level but also their integration in an overall, complex and real system. Consequently, services offered by these technologies and developments are highly increased.
- Analysis of the impact of introducing the different systems in terms of safety, comfort, efficiency, etc... helping to establish recommendation and regulations that shall be observed by the next generation of electric vehicles, as well as for the new developed infrastructures.
- Analysis and validation of potential business models in Spain.

    - Best practices coming from EU and National on-going projects involving EV in Spain (Green eMotion, FREVUE, etc.).

- Accelerate the use of transport means more environmentally friendly, as well as the rational use of energy with lower carbon emissions. (Detailed LCA analysis, including full cradle to grave).

2.12. Regulation and standards, homologations, tests, validation, safety and type approval of hybrid and electric vehicles

Objective and scope

The core of the electrification of road transport is new vehicles (EV) based on electric traction and the modules and components being part of them. Different concepts of cars, trucks and buses are in the main focus of current research activities and type approval processes to operate in both urban and interurban roads. The pure electric vehicles due to their zero local and potentially minor greenhouse gas emissions (if energy from renewable sources is used) are considered the cleanest option are the mile stones towards sustainable road transport. Hybrid vehicles (HEVs) such as micro, mild and full hybrid are a favourable entry point in this process. The increased energy density, capacity, safety, lifetime, cycle life, and greater standardization of mechanical and electrical interface and better communication, with cost reduction are the major challenges for production mass of energy storage systems and their viability in the EV and HEV. The integration of cells in the packaging of the batteries is an important issue particularly with regard to safety, cost, manufacturing, diagnostics, maintenance, repair and recyclability. It is considered necessary therefore to develop system architectures and energy management of change elements of rapid activation and the establishment of evaluation standards and testing.

The deployment of EV in the market will require the provision of support infrastructure and its integration into a complete system of large-scale mobility. The purchase of power for EV should be as easy as today's refilling at service stations. There should be no barriers to the use of different facilities,

suppliers, rates or types of charging stations. For this purpose, the concept vehicle-to-grid combines a fast power charging with a smart payment system. In this regard will require new technologies of information and communication technologies make use of standard protocols for exchanging data falls infrastructure and storage system. It will be necessary to design the technology of charging stations, the standardization of connections, the rapid charging process, the security requirements and the collection process according to different rates, depending on the origin of electricity charged.

There is now a notable lack of enforceable laws and regulations in the systems involved and in the electric and hybrid vehicles, which ensure the required safety levels and conditions of standardization to facilitate its use, international level, with zero or reduced technical barriers.

The objective is to stimulate and support pre-standardization research for both new systems and for vehicles as a whole.

Major R&D areas

1. **Identification of safety standards of components, systems and hybrid and electric vehicles** related to storage, use and supply of energy on board, as well as pollutant emissions level produced.
2. **Identification of safety standards of the facilities** of electricity supply to vehicles.

In both cases, technical requirements must be defined in international regulations and the tests necessary to verify compliance.

Expected impact

- Contribute to tests standardization both at components and vehicle-infrastructure levels.
- Contribute to safety of electric and hybrid vehicles on the road.
- Raise the level of trust of future users of such vehicles.
- Reduce the costs related with engineering and production processes of hybrid and electric vehicles.

Annex: Technology domains & entities involved in the document elaboration

Area	Contributors*
1. INTRODUCTION: Spanish strengths	SERNAUTO, ANFAC, REE, IBERDROLA, ENDESA, IDAE, LOGISTOP, INSOLATIO
2. RESEARCH PRIORITIES	
2.1. Materials, manufacturing and processes	TECNALIA, ANFAC, CIE, GESTAMP, SERNAUTO, ANTOLIN, UPC, CTAG, MONDRAGÓN, LOGISTOP, CAAR, CIDAUT, U. MONDRAGÓN, ZANINI, ITENE, ASCAMM
2.2. Systems and components for electric vehicles	SERNAUTO, GESTAMP, UPC, TECNALIA, CTAG, LEAR, MONDRAGÓN, CIE, FICOSA, CEGASA, CIDETEC, ZANINI, ASCAMM, IDIADA, U. MONDRAGON, FAURECIA, QUIMERA, INSIA-UPM, CSIC, Jofemar
2.3. ICEs for light vehicles (range extenders)	CMT-UPV, IVECO, CIE AUTOMOTIVE JOFEMAR, CIDAUT, MONDRAGÓN, TECNALIA, IDIADA, U. MONDRAGON, INSIA-UPM, UPC
2.4. Heavy duty vehicles: focus on electrification and alternative technologies	ANFAC, IVECO, NISSAN, CMT-UPV, TECNALIA, IDIADA, CIDETEC, CEGASA, QUIMERA, INSIA-UPM
2.5. ICEs for heavy vehicles	CMT-UPV, IVECO, CIE AUTOMOTIVE, CIDAUT, MONDRAGÓN, INSIA-UPM
2.6. Smart infrastructure and services for Green Vehicles	CIDAUT, CTAG, UPC, ENDESA, IBERDROLA, REE, FICOSA, ACCIONA, LOGISTOP, FITSA, ITENE, ATOS, ASCAMM, CEGASA, IDIADA, CARTIF, SICE, GAMESA, U. MONDRAGON, TTES. BARCELONA
2.7. Grid integration	REE, IBERDROLA, ENDESA, IDAE, UPC, TECNALIA, ACCIONA, ATOS, CEGASA
2.8. Sustainable urban mobility: vehicles and concepts	INSIA-UPM, UPC, TECNALIA, CTAG, MONDRAGÓN, LOGISTOP, CIDAUT, ACCIONA, ASCAMM, ATOS, ITENE, INTA, SICE, CARTIF, IDIADA, U. MONDRAGON, QUIMERA, CEGASA
2.9. Sustainable urban mobility: connected vehicle and fleets	CTAG, CIDAUT, UPC, TECNALIA, MONDRAGÓN, FICOSA, LOGISTOP, ANFAC, ASCAMM, IDIADA, QUIMERA, ITENE, SICE, ITS ESPAÑA, ETRA I+D, GMV, TELEFÓNICA I+D

Area	Contributors*
2.10. ICT technologies for the improvement of the whole transport system	CTAG, INSIA-UPM, UPC, TECNALIA, MONDRAGÓN, LOGISTOP, CIDAUT, ACCIONA, ASCAMM, ITENE, IDIADA, U. MONDRAGON, ATOS, GMV, INTA, SICE
2.11. Demonstration and field operational tests	CIDAUT, SEAT, IVECO, HISPANO, CAAR, CTAG, REE, IDAE, IBERDROLA, ENDESA, ANFAC, INSIA-UPM, ACCIONA, MONDRAGÓN, LOGISTOP, IDIADA, QUIMERA, ASCAMM, ATOS, ITENE, SICE, INTA, CEGASA, TECNALIA, Ttes. Barcelona, ECOMOTIVE
2.12. Regulation and standards, homologations, tests, validation, safety and type approval of hybrid and electric vehicles	INSIA-UPM, CIDAUT, CMT-UPV, CTAG, MONDRAGÓN, IDIADA, IBERDROLA, ENDESA, INTA, QUIMERA, Ttes. Barcelona

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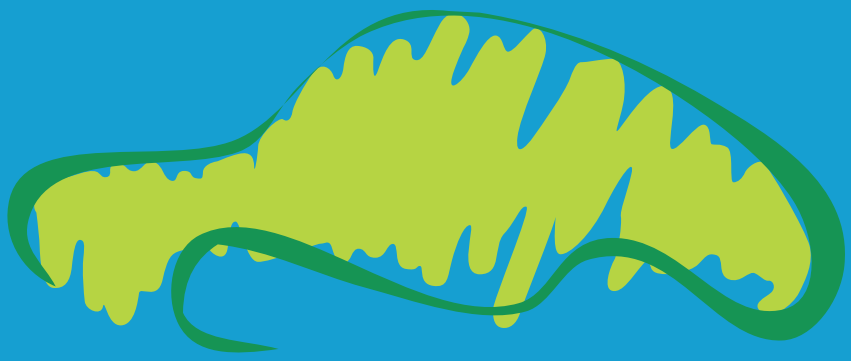
Fp7 Green Cars / Horizon2020 Green Vehicles Conference 2013: New opportunities for the clean vehicle sector



Programme

FP7-Green Cars / Horizon2020-Green Vehicles

Workshop Agenda
19th November 2013
Recinto Firal Gran Via, Barcelona

MORNING SESSION - Moderator: Ignasi Ferrer (IDIADA)

9:00 am

Wellcome
Honorable Sr. Felip Puig
Minister of Industry, Tourism and Employ
Magnificent Mr. Antoni Giró
UPC Rector
Elisa Robles,
CDTI General Director

9:30 am — 1st session: Challenges and opportunities of participation and funding in Europe

9:30 am

Horizon 2020
Colette Maloney
(Head of Unit Smart Cities and Sustainability Unit, European Commission Directorate-General for Communications Networks)
Maurizio Maggiore
(Directorate General for Research and Innovation, European Commission)

10:15 am

Role and how to participate in PPP's, JTI's and ETP's
Wolfgang Steiger
(ERTRAC and European Green Vehicles Initiative Association (EGVIA))
Carlos Navas
(Fuel Cells and Hydrogen Joint Undertaking)

11:30 am — 2nd session: Proactive positioning vs. big challenges

11:30 am

CONNECT-EU Group Initiatives
Mariona Sanz
(ACCIÓ)

11:50 am

Catalan Strategic Agenda in Sustainable Vehicles
José Manuel Barrios
(CONNECT-EU Group: Sustainable Vehicles)

12:10 pm

Update of the document "Spanish Contributions and priorities to the European Green Vehicles Initiative – EGVI"
María Luisa Soria
(SERNAUTO)

12:30 pm	**3rd session: Electric vehicle industrialization (Social and technological challenges)**

ROUND TABLE: ***From challenges to opportunities***

Moderator:
Vicenç Aguilera
Automotive Industry Cluster of Catalonia (CIAC))

Participants:
Automotive manufacturers: Tino Fuhrmann (SEAT), Sergio Alcaraz (NISSAN)
Automotive suppliers / ICT: Enric Vilamajó (FICOSA)
Consumers and end-users: Lluis Puerto (RACC)
Infrastructure: David García-Pardo (IBERDROLA)
Future Industry: Joan Guasch (ASCAMM)

Questions and answers, open debate

13:30 pm	**Morning session conclusions:** **Mariona Sanz (ACCIÓ) and Alejandro Ruiz (CDTI-MINECO)**

AFTERNOON SESSION - Moderator: Fernando Acebrón (ANFAC)

15:30 pm	**1st session: Strategies and visions of vehicle manufacturers in alternative fuel vehicles area**

15:30 pm **SEAT**
Tino Fuhrmann

15:50 pm **NISSAN**
Javier Redondo

16:10 pm	**2nd Session: Small urban vehicles**

16:10 pm **iSHARE: a car-sharing vehicle for urban mobility**
Ricardo Satué (IDIADA)

16:15 pm **CHISPA electric public cars**
William Rendall (CHISPA)

16:20 pm **Electric Commuting Motorbike**
Marc Barceló (Volta Motorkbikes)

16:25 pm **Cities demonstrating automated road passenger transport: Citymobil2**
Alberto Peña (TECNALIA)

16:30 pm **Questions and answers**

16:40 pm	3rd session: Systems and components for EVs / Advanced ICEs
16:40 pm	**HIDRONEW XXII** Joaquín Chacón (JOFEMAR)
16:45 pm	**Control systems Electric – Vehicle Control of individual wheel Torque for On- and Off-Road Conditions (E-VECTOORC)** Isaac Nadal (ITA)
16:50 pm	**Motor in wheel for small citycars** Iñaki Iglesias (TECNALIA)
16:55 pm	**Battery pack for SEAT LEON PHEV** Xavier Motger (FICOSA)
17:00 pm	**Development of HD Diesel engines by using alternative fuels** Xavier Ribas (IDIADA)
17:05 pm	**Innovative technologies for the development of a Light Range Extender Vehicle** José Mª López (INSIA-UPM)
17:10 pm	**Questions and answers**
17:20 pm	4th session: ICT for EV integration in the transport system
17:20 pm	**ONFLEET – Electric Fleet Management System** Jorge León (ITENE)
17:25 pm	**PPU-SIM: Pay Per Use for a Sustainable Intelligent Mobility** Carlos Moliner (IMAUT)
17:30 pm	**Walkiria: Real physical demonstrator in an environment with standard and mobile charging stations with energy storage, generation equipments and ICT developments with communications to test and charging optimization algorithms** Patricio Peral (ITE)
17:35 pm	**Capturas, Telematic Platform for connected vehicles and smart mobility** Lluis Olivet (OTC Engineering)
17:40 pm	**e-DASH'E-Mobility Broker** Andrea Rossi (ATOS)
17:45 pm	**EMERALD: Enery ManagEment and REchArging for efficient eLectric car Driving** Roberto Giménez (HI IBERIA)
17:50 pm	**Questions and answers**
18:00 pm	**Closure of the session**

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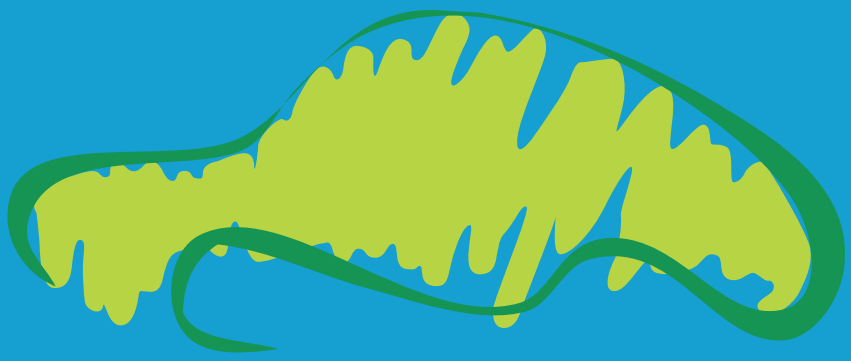


Oral communications

European Innovation Partnership on Smart Cities and Communities

Colette Maloney
European Commission, Directorate-General for Communications Networks, Content and Technology

1. The Partnership's Strategic Implementation Plan

The Smart Cities and Communities Partnership brings together city leaders, industry and the research community working to identify and then to deliver, new ways of improving European cities in a more joined up way. The Partnership's Strategic Implementation Plan sets out a broad range of new actions and approaches to encourage our cities to become smarter. The plan concentrates on how to drive forward improvement in buildings and planning, new Information Technologies, transport and energy, and new ways of integrating these areas. These approaches include a presumption that data be "open by default" – meaning that the data can be re-used by others to create additional benefits for citizens, businesses and governments.

The Plan also suggests improvements to the way that cities are run with better ways of involving citizens and more collaborative ways of doing things. It suggests innovation zones, new business models, a re-evaluation of rules and legislation and a more standardised approach to data collection and use to enable better comparisons between approaches and between cities.

This is just the beginning of a large scale programme of work by all the partners and many others. An important part of that work will be the "Lighthouse Projects" - cities which will demonstrate and deliver Smart City solutions on a large scale. These Projects will be partly financed by the European Commission's Horizon 2002 Research Funds. Further business and public funding will help to spread these new solutions to other cities and economies of scale will help to make these "innovative" and "high tech" solutions the norm – available more easily to all cities and neighbourhoods.

More details about these next steps and about European Commission funding and Business Commitments will be announced at the official launch of the delivery plan on 26 November.

2. Electromobility within Smart Cities

Within the Strategic Plan the three priority areas: urban sustainable mobility, built environment and integrated infrastructures, were identified. Electromobility plays a vital role in bridging these three areas. Also, it offers on its own a triple bottom gain, in social, economic and ecological terms, namely increased safety, job creation and higher competitiveness, and reduced emissions.

Apart from the creation of the Partnership the European Commission already co-funds over 20 running research and deployment projects in the area of ICT for electromobility. With a high success rate these projects will secure new cutting edge technology "Made in Europe". Soon the Commission will publish new calls for co-funding.

http://ec.europa.eu/eip/smartcities/

Green vehicles research funding in Horizon 2020

Maurizio Maggiore
European Commission DG RTI – Sustainable Surface Transport Unit

The European Green Cars Initiative (EGCI) and its follow-up

The funding of alternative vehicle research in FP7 has been pursued for the first time through a new type of scheme, the Public Private Partnership (PPP), which has been launched in 2008 as a response to the financial crisis.

The EGCI has recently completed its last call, and running projects are starting to deliver very interesting results, some of which will be presented. The cooperation has been very positive and all stakeholders recognized the advantages in comparison to more formalized approaches, asking to continue in the same direction.

A more structured, yet agile scheme has therefore been developed in the preparation of Horizon 2020. The contractual PPP (cPPP) tries to safeguard the aspects which have been appreciated of the EGCI experience with a more formalized structure entailing a clearer commitment from the private stakeholders.

The new contractual PPP, after approval by the legislators expected in November-December, will be called European Green Vehicle Initiative, and the title already highlights one of the main changes, i.e. that it will deal with all categories of road vehicles, including for the first time two wheelers and other light vehicles in the L category.

Moreover the focus on electric vehicles in the EGCI will be widened to hybrids, and alternative fuels will also be considered.

Overall EGCI projects will continue to deliver innovation and scientific results for a few more years, while EGVI will take the relay and build on this experience to achieve the pollution and efficiency improvements in road transport European citizens need.

http://ec.europa.eu/research/horizon2020/index_en.cfm

EVS27 – EGVI contribution

Prof. Dr. Wolfgang Steiger
EGVIA

The launch of the European Green Vehicles Initiative (EGVI - 2014-2020) in the framework of Horizon 2020, in continuation of the European Green Cars Initiative (EGCI - 2009-2013) implemented in FP7, constitutes a new opportunity for the clean vehicles sector. Dedicated to delivering green vehicles and mobility system solutions which match the major societal, environmental and economic challenges ahead, the new initiative aims at accelerating research, development and demonstration of technologies allowing the efficient use of clean energies in road transport.

Established on the basis of a contractual arrangement, the EGVI takes the form of a public-private partnership involving the industry, research and associate members of the European Green Vehicles Initiative Association (EGVIA) and the various Directorates General of the European Commission providing financial support for the implementation of the Initiative. The approach and working methods developed are similar to those of the EGCI, which was created in an ad-hoc manner in response to the global economic crisis of 2008, and led to the joint funding of more than 90 collaborative research projects. Within the EGVI, three rounds of biennial calls for proposals are expected to be launched over the seven-year period, allowing for a wide range of new research projects to be put in place. The publication of one specific call entitled 'Green Vehicles' is already foreseen in the Transport Work Programme 2014-2015.

The scope of the EGVI slightly differ from its predecessor's: the focus is placed on the energy efficiency of vehicles and alternative powertrains, thus also including additional forms of alternative energies. Moreover, the types of vehicles covered has been broadened to encompass all road transport vehicles - from passenger cars to vans, trucks, buses, two-wheelers and new vehicle concepts. With this focus, the EGVI tends towards the establishment of a competitive and sustainable transport system in Europe and addresses one of the major Societal Challenges outlined in Horizon 2020: the development 'Smart, Green and Integrated Transport'. Besides, the EGVI involves the automotive, smart systems and smart grids industries in a cross-sectoral approach, with the objective to positively impact on the innovative strength and global competitiveness of the European economy.

A document of reference for the implementation of the EGVI PPP has been produced: the Multiannual Roadmap for the EGVI Contractual Public-Private Partnership takes into account the roadmaps from the three European Technology Platforms involved in the Initiative - ERTRAC, EPoSS and SmartGrids, and outlines the vision, research and development strategy, as well as the expected impact and governance model of the European Green Vehicles Initiative. Moreover, it further describes the scope of the Initiative and specifies the range of technologies that should be addressed: all product layers are concerned, from modules to systems and vehicles, as well as the integration of resources and the integration into the infrastructures. Therefore, the EGVI develops an integrated approach, with the objective to cover the entire process chain from resource application to demonstration and creation of services, and to extend research and development to innovation.

Hydrogen and Fuel Cell Vehicles in the EU Programme

Carlos Navas
Project Manager for Transportation and Refuelling Infrastructure, Fuel Cells and Hydrogen Joint Undertaking

1. The Fuel Cells and Hydrogen Joint Undertaking: a Public-Private Partnership

The Fuel Cell and Hydrogen Joint Undertaking (FCH JU)[1] was established by Council Regulation (EC) 521/2008 of the 30th May 2008 as a Community Body[2] on the basis of Article 171 of the EC Treaty[3], with the European Commission and the Industry Grouping as founding members. The Research Grouping joined shortly after.

The objectives of the FCH JU are to:

- Aim at placing Europe at the forefront of fuel cell and hydrogen technologies worldwide and enabling the market breakthrough of fuel cell and hydrogen technologies, thereby allowing commercial market forces to drive the substantial potential public benefits.
- Support RTD in the Member States and countries associated with the Seventh Framework Programme in a coordinated manner in order to avoid market failure, focus on developing market applications and facilitate additional industrial efforts towards a rapid development of fuel cell and hydrogen technologies.
- Support the implementation of the RTD priorities of the Multi-Annual Implementation Plan of the FCH JU, notably by awarding grants following competitive calls for proposals.
- Undertake supporting actions where appropriate through calls to tender.
- Aim to encourage increased public and private RTD investment in fuel cells and hydrogen technologies in the Member States and Associated countries.
- Ensure the coordination and efficient management of funds.

In terms of direct support by the FCH JU, the main instrument for achieving these goals from the period of 2008-2013 has been the award of research, demonstration and support projects following competitive annual calls for proposals. Specifically, from 2008 to 2013 the FCH JU has awarded respectively 16, 28, 26, 33, 28 (3 of which are still under negotiation) and 21 (under negotiations) grant agreements, for a total of 152 projects. The total amount of public funds being committed to the programme is 470M€, to be matched by contributions from industry and research.

In view of the success of the programme and in order to address the challenges posed by the present status of fuel cell and hydrogen technologies, while taking advantage of the increased level of collaboration between all relevant public and private stakeholders, a continued effort is envisioned over the next few years as manifested in the proposal sent by the EC to the EU Council to extend the FCH JU under H2020 with a potential increase in commitment of public funds of up to 700M€.[4]

2. Support for Hydrogen and Fuel Cells by the FCH JU for Transport Applications

The FCH JU is supporting transport applications with a total of just over 150M€ during its current running programme. The breakdown of the themes being supported is shown in the table below.

1. http://www.fch-ju.eu/
2. Council Regulation (EC) No 521/2008 of 30 May 2008 setting up the Fuel Cells and Hydrogen Joint Undertaking. OJEU. L153/1-20, 12.6.2008
4. Now Article 187 of the Treaty on the Functioning of the European Union (TFEU)
5. Public-private partnerships in Horizon 2020: a powerful tool to deliver on innovation and growth in Europe. (COM)2013 494 final

Project theme	Amount	#Projects
Large scale demo	91,000,247	7
MEAs	21,444,256	9
H2 Storage	3,386,124	2
Bipolar Plates	5,015,271	2
Support	5,733,824	5
Stack development	7,757,273	1
Modelling & Simulation	2,294,106	1
APUs for trucks	8,217,126	2
APUs for airborne applications	5,219,265	1
Advanced HRSs	3,566,343	1
	153,633,835	31

In particular, the demonstration projects are showcasing a total of 46 buses and nearly 150 passenger cars incorporating fuel cell technology, while contributing to the deployment of new required infrastructure for the future roll-out of vehicles.

It is expected that transport applications will also be supported within the framework of Horizon 2020. As stated in the EC proposal, the objective for transport applications is to reduce the production cost of fuel cell systems to be used in transport applications, while increasing their lifetime to levels competitive with conventional technologies.

Regional Technology Platforms: Groups CONNECT-EU in Catalonia

Mariona Sanz
ACCIÓ

The Government of Catalonia launched the CONNECT-EU Groups in 2010 to boost the participation in the 7th Framework Programme (FP7) through the CONNECT-EU Program, a program jointly managed by the Agency for the Competitiveness of Catalan companies ACCIÓ, belonging to the Department of Enterprise and Employment, and the Agency for Management of University and Research Grants (AGAUR), part of the Department of Economy and Knowledge of the Government of Catalonia.

The Connect-EU Programme aims to increase the capacity to attract research funds for Catalan companies and public and private research institutions, promoting and encouraging qualitative research and innovation to advance on the path of the Lisbon strategy and further develop a European knowledge-based economy.

In this regard, over the period under FP7, 2.1% of total EU funding engaged in R&D projects was recruited by companies and research entities from Catalonia, reaching 672 million euros. On this amount, 14.3 mill Euros were directed to the Transport calls and 8.2 mill Euros to the PPP Green Car, achieving a 2.49% of all funds available for this initiative. This demonstrates the importance of this sector for our region.

Coordinated by the Polytechnic University of Catalonia and IDIADA, the Connect-EU network of Sustainable Automotive Transport works in collaboration with several working groups related to the sustainable vehicle type: passenger car, industrial vehicles, and motorcycles, making the electromobility one of the main field of work in Catalonia.

In the course of these past years, these groups have actively participated in the different European technology platforms. They have been responsible for defining the Catalan strategic agendas to be diffused among all relevant European forums during the definition of the R&D programmes; and thus have disseminated the information about funding opportunities at European level among all the key agents of the sustainable automotive sector. CONNECT-EU groups have raised the interests and priorities of the Catalan organizations to the EU in a coordinated way.

Strategic Research Agenda of the Connect-EU Sustainable Surface Transport Group

José Manuel Barrios
Applus+IDIADA

1. Introduction

The automotive industry and its products play an essential role in European life. The automotive industry contributes essentially to increasing mobility and to growing the European Economy. Europe is worldwide the largest car manufacturer and exports more cars and automotive parts than it needs to import. The automotive sector is known for its tough competition and the low margins companies have to work with, a situation that is exacerbated by surplus capacity globally. The research and development activities should be the basis for the competitiveness of the different entities covering the whole valued chain.

In Catalonia, the automotive industry is one of the main pillars of Strategic Industrial Catalan Plan. The volume of exports, extent of investment in R&D, level of employment generated both directly and indirectly and many other indicators place it at the forefront of industrial sectors in Catalonia.

In this scenario, the CONNECT-EU GROUP: SUSTAINABLE SURFACE TRANSPORT is an association of industry, research and academia entities in the region of Catalonia (Spain) dedicated to the automotive sector with the objectives of (1) enhancing the R&D activities of the region at European level; (2) defending the interests of Catalan organisations in the field of sustainable surface transport in Europe; (3) promoting the knowledge and skills of businesses, universities, technology centres and institutions in research programmes related to the automotive sector; (4) rising to the challenges in sustainable surface transport with a focus on technologies for green vehicles in Catalonia; (5) promoting the growth of innovation and R&D on an international scale; (6) preparing Catalan businesses and institutions to respond to new major technological challenges (7) improving services and products for better industrial competitiveness in Catalonia. It brings together the most prominent independent R&D providers, OEM's, TIER's and end users associations in the automotive sector throughout Catalonia covering the whole value chain. At present, its membership includes SEAT, NISSAN, SIEMENS, FICOSA, UPC, ASCAMM, RACC and IDIADA. Further information can be found at http://automociosostenible.upc.edu. The main objective of our group is to bring the visions and opinions of the main stakeholders of our region to the advisory groups and councils in Europe.

One of the main results of the working group was the Strategic Research Agenda of the CONNECT-EU SUSTAINABLE SURFACE TRANSPORT GROUP presented in the JORNADA GREEN VEHICLES 2013 held in Barcelona on 19th of November 2013. The priorities were based on the roadmaps of ERTRAC, the latest public position papers published from the main European Associations (EUCAR, CLEPA, EARPA and ERTICO) and the answers and contributions to the questionnaire sent to all the entities (public administration with competences in the field, universities, technical centers, user groups, research institutes, development partners, TIER's, OEM's and other industrial companies) located in Catalonia active in the automotive field. The questionnaire was elaborated by the CONNECT-EU SUSTAINABLE SURFACE TRANSPORT CORE GROUP. The document includes the interests and level of interest proposed by the entities that answered the questionnaire. The relevance of the individual research topics was estimated based on the number of entities currently active in the field with clear strategies and guaranteed competences in the area.

2. What are the main areas of interest for the Catalan entities in the automotive sector?

Competitiveness

- Reducing vehicle manufacturing costs: for European consumers, the proportion of their income required to purchase a vehicle has fallen in many countries over the last 15 years. However, within a context of stagnation (and decline in some cases) in purchasing power, it's very important for automakers to reduce their product manufacturing costs as much as possible.

- Improving features: like any other product, clients expect constant improvement and the case of vehicles is a good example. This is evident simply from the huge differences between an average vehicle made ten years ago and one from today.

Increased mobility

Vehicle connectivity: manufacturers are working to ensure that vehicles don't only give as much information as possible and interact with their passengers but also with the environment. New technologies have just started their deployment for traffic management, but there is still a long way to go to having cooperative and intelligent transport systems on the road, which would lead to automated traffic benefiting all pillars of sustainable transportation. For the moment, priorities should be focused on the deployment of urban management systems, the integration of the electric vehicle in the urban mobility system, the identification of new mobility patterns and the enhancement of interaction between vehicles, travellers and goods.

Environmental impact

There is a strong social demand for decreasing footprint of automobiles and electric vehicles and other alternative powered vehicles are foreseen as contributing substantially to this. In order to ensure that EVs and the other alternative powered vehicles provide a similar level of performance to vehicles fitted with internal combustion engines, much research in different areas is still needed. Autonomy and connection to the grid are still pending topics. This is a challenge for a correct deployment of the EVs and might need different approaches, such as the use of new materials for both vehicle and components or new simulation and testing tools.

- Reducing emissions of contaminating particles and greenhouse gases: this trend is determined, in the European case, by a demanding agenda that aims to dramatically reduce vehicles' contaminating emissions, albeit without underestimating the growing demand for green vehicles on the part of consumers.
- Reducing fuel consumption: as fuel prices increase, they have a greater effect on the vehicle's life cost. Consumers are increasingly more aware of this and demand vehicles with low fuel consumption.
- Reducing the noise emitted by vehicles: vehicles have improved a lot in this aspect and such reduction is being sought in the engine, aerodynamics and tyre friction. Noise reduction is particularly important and desired in the increasingly denser urban areas.
- Using other, less contaminating fuels: work has been carried out on engines so that vehicles can accept a greater proportion of biofuel in the fuels they use. European regulations have also set out the line to follow in this respect, with the obligation to use 5.75% of biofuel in 2010. Other technologies, such as natural gas vehicles, also have their place, albeit with a very small penetration.

Trusted safety

Increase in safety: road deaths are one of the main scourges of western society. European manufacturers have spent many years working on improving the safety of their products in order to reduce the consequences of accidents. Newer cars offer very high levels of protection. However, these improvements have not been enough to meet the objectives of the White Paper of the Commission of decreasing by 50% the fatalities in road accidents by 2020. This fact, combined with the need of an increased mobility and the use of alternative powered vehicles with some limitations by now, suggests that safety must remain as a main priority for the automotive industry. Vulnerable road users, the deployment of active safety systems in all vehicle ranges and the integration with cooperative systems still need to be addressed.

Update of the Spanish Contributions and Priorities to the European Green Vehicles Initiative – EGVI

María Luisa Soria
SERNAUTO

After the launch of the European Green Cars Initiative in 2008, Spanish stakeholders related to the eco and electromobility identified the national priorities and prepared a document[1] which was presented in the conference "Green Cars and Leadership Opportunities" held in Valencia in April 2010. This document was the basis for the contributions to the documents and roadmaps prepared at European level since then.

In 2013 a new document has been elaborated, with the purpose of updating the Spanish contributions and priorities to the European Green Cars Initiative (EGCI), adapting them to the new European Green Vehicles Initiative (EGVI) under the EU Research and Innovation Framework Programme Horizon 2020. Its aim is to translate the interests and needs in research and development of Spanish entities involved in this field, to help medium and long term development of sustainable transport and eco-efficient mobility solutions. It also sets out the strengths of the "value chain" of the Spanish system, in order to achieve a clear positioning within the EGVI framework.

Updating work has been developed within the CDTI Green Vehicles Technical Forum, in which the main Spanish stakeholders of the eco- and electromobility innovation and value chains are represented (industries, research centres and academia in the fields of automotive and road mobility (both light and heavy duty vehicles), energy, logistics, ICT...).

Both the Spanish strengths and the priorities formerly identified have been reviewed and updated, according to the new focus of the EGVI and Horizon 2020 pillars and the results of running projects initiated in past years. The document is available at: http://www.cdti.es/index.asp?MP=7&MS=225&MN=4&TR=A&IDR=1&iddocumento=4105&r=1280*1024 and also in page 10 of his book.

The following priorities have been identified and are described in this document:

1. Materials, manufacturing and processes.
2. Systems and components for electric vehicles.
3. ICEs for light vehicles (range extenders).
4. Heavy duty vehicles: focus on electrification and alternative technologies.
5. ICEs for heavy vehicles.
6. Smart infrastructure and services for Green Vehicles.
7. Grid integration.
8. Sustainable urban mobility: vehicles and concepts.
9. Sustainable urban mobility: connected vehicle and fleets.
10. ICT technologies for the improvement of the whole transport system.
11. Demonstration and field operational tests.
12. Regulation and standards, homologations, tests, validation, safety and type approval of the hybrid and electric vehicles.

1. Spanish contributions and priorities to the European Green Cars Initiative (EGCI), released on 26 November 2009 and reviewed version 09 March 2010

iShare: a car-sharing vehicle for urban mobility

Ricardo Satué
Applus IDIADA

1. Urban mobility and car-sharing

In recent years, we have seen how more and more car-sharing services being offered across Europe and North America. There are several reasons behind this: higher petrol prices, changes in consumption behavior, limited and expensive parking in urban areas, concerns about sustainability, economy and others, but the fact is that more and more drivers are shifting their priority from ownership to service use. Although car-sharing appeared in Europe in the 1940s and different initiatives started in the 1970s and 1980s, the concept did not become popular until the early 1990s and since then it has been continuously growing over the last 20 years.

Car-sharing may be beneficial for both the users and the municipalities. Car-sharing reduces the number of vehicles on the streets and consequently the traffic flow improves and this means fewer CO_2 emissions. Also, car-sharing users tend to consider other options such as public transport or walking as alternatives to driving. Car-sharing has also social benefits as it gives access to vehicles to a bigger population, allowing more people to have access to a point-to-point fast, comfortable and affordable mobility. And there are also economic benefits for the population as they can adapt their expenses to their real transportation needs. For the municipalities, car-sharing means local employment, better live conditions and more economical opportunities for the citizens.

The growth in popularity of car-sharing is also reflected in the type of companies behind car-sharing organizations. Initially they were not-for-profit or co-operatives and now include as well Public Transport Operators and for-profit organizations, in many cases with partners such as Vehicle Manufacturers (BMW, Daimler, Peugeot, etc.), Car Rental Companies (Sixt, Hertz, Avis, etc.) and Infrastructure Suppliers (EDF, Veolia, Better Place, etc.).

The evolution of the car-sharing business has so far mainly been related to the deployment of automated reservations, key management and billing. The larger car-sharing organizations are applying today their technologies to facilitate the operation and management of services, offer greater convenience and flexibility for users, and provide additional security for vehicles and key management systems, but no significant evolution has been seen related to the vehicle design, which is essential to make the service more affordable and easier to apply in more cities worldwide.

2. iShare: IDIADA's proposal for car-sharing

With the objective of demonstrating its complete vehicle development capabilities, IDIADA decided to develop and build a running show car putting together different ideas aimed at creating a specific vehicle for car-sharing that would facilitate the introduction of this service.

In order to define the vehicle specifications, IDIADA carried out a public survey and met with potential operators. With their inputs we concluded the vehicle should be a small urban car, non-pollutant, have two seats with some luggage capacity, a minimum speed of 80 km/h, a range of 100 km at least, small, robust, easy to park and to clean.

With these requirements IDIADA has developed an electric vehicle that fits into the category of Heavy Quadricycles L7e with a maximum peak power of 15 kW, that satisfies the speed and range requirements above mentioned and with a recharging system that would give back its full range back in 1.5 to 2.5 hours depending on the plug system, corresponding the longest time to a normal wall plug (220 V 16A).

In order to maximize the number of vehicles parked in a given space, the vehicle dimensions have been limited to 2.0 meter long and 1.4 meter wide. This allows to park the vehicle in perpendicular in a normal in-line parking space and to fit 2.5 of these cars where previously only a normal car did.

The vehicle has a tubular structure made of bended steel tubes and the interior, including the seats, and exterior trims

are made of recyclable plastic such as ABS that can be easily dismounted and replaced. This allows keeping the vehicle always in good conditions as it can be easily cleaned and if necessary, a given part may be replaced with a new one that can be in part made of recycled material coming from other dismounted parts in what we call the "restoration process".

This "restoration process" is particularly important for the implementation of a car-sharing system based on this design as it would maximize the operational life of the vehicle, in contrast to normal passenger car in which such a restoration process would have an important cost. This process may also be interesting for municipalities as would generate local employment additional to the staff already necessary for the operation of the service.

Also to facilitate its application to car-sharing fleets, the vehicle has a communication system that can transmit information about the vehicle conditions, i.e. battery state-of-charge, malfunctions, positioning... and that also enables the remote control of certain functions such as the door and window opening.

The same communication system is used to transmit to the vehicle the opening and start code that the users need to have access to the car. IDIADA has imagined to use the vehicle in both closed or open car-sharing schemes. In a closed car-sharing system, the vehicle is rented and returned to a car-sharing station where a number of actions may be done by the operator's staff. In an open car-sharing scheme, the vehicle may be found anywhere in a given area of the city and may be left as well in that area, without forcing the user to go to a pick-up/return station and thus giving the users more flexibility.

One of the difficulties of the open car-sharing is the management of the user access to the vehicle as it is not possible to provide a physical key. In order to solve this issue, the system will send a unique bar code to both the user and the vehicle once the booking process is completed through the website or a mobile phone application. This bar code will serve the user to open the vehicle

CHISPA electric public cars

William Rendall
CHISPA project coordinator

1. Introduction

CHISPA electric public cars are a response to the paradigm shift taking place from car ownership to car-sharing, a market that has already grown from a few thousand clients only 5 years ago to almost 2 million in 27 countries today [1].

The 21st century car industry no longer makes profits from manufacturing, but from financing car purchases, therefore, at a time of economic instability, coupled with saturated road transport with ever increasing environmental damage, it is time to design custom-built carsharing vehicles and improve their efficiency.

The patented CHISPA vehicles are foreseen specifically for one-way trips in urban and peri-urban areas, a market place for 50% of all car kilometres driven. Their patented design with articulated and interconnecting chassis allows them to be towed in car trains, redistributing them quickly to where they are needed. In this way it should be possible to triple the daily average of 4 trips per vehicle up to 12 and subsequently reduce fares from average of 7.50 € down to 2.50 €.

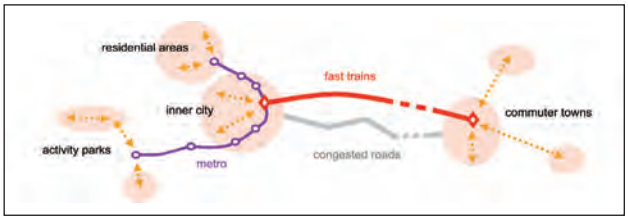


Figure 1: Areas for typical CHISPA services.

2. The distribution problem with present urban carsharing

Existing urban carsharing operators, such as Autolib or Car-2go, are unable to supply vehicles when and where they are needed, even with large workforce of drivers, making the service unreliable for the user and expensive for the operator.

Figure 2: Autolib map - Paris nearest available car at 1 km.

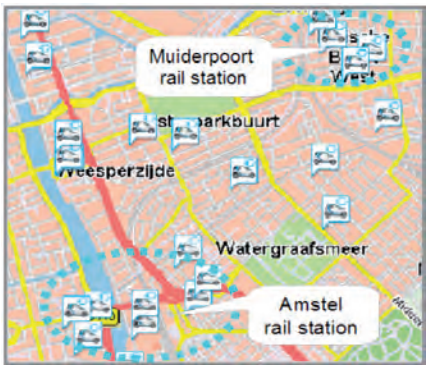


Figure 3: Car2go map - Amsterdam groups of unused cars.

3. The patented CHISPA vehicle

The CHISPA vehicle's articulated and interconnecting chassis enables safe towing along a single path with 7 vehicles at a time. It will be homologated as a heavy quadricycle, L7e: 2 or 3 seats and max. speed of 45 km/h or 80 km/h.

The batteries only need a single night-time charging for the 12 daily, urban trips, that average 6km each, a total less than 100 km.

[1] http://en.wikipedia.org/wiki/Carsharing

Figure 4. truck with CHISPA towing train.

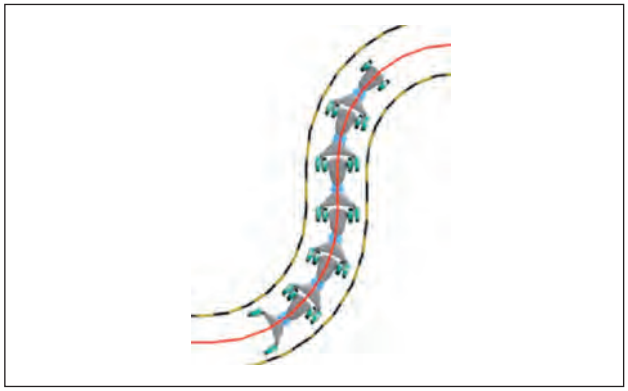


Figure 5. Single path of articulated, interconnecting chassis.

4. AVANZA - iCOPILOT project

An experimental CHISPA prototype has been built as part of the iCOPILOT project financed by the Spanish Ministry of Industry AVANZA programme lead by IT engineers IXION Industry & Aerospace [2], Madrid. The project is also developing an automatic docking system and assisted driving for CHISPA vehicles.

Figure 6. Experimental prototype.

5. Industrialisation by Little Electric Cars [3]

A start-up company is to be formed with industrial partners Little Electric Cars from Galicia and IXION engineers. It will be directed by Javier de Santos, CHISPA's mechanical designer and will develop and build the CHISPA vehicles.

A showcase demo service is to operate in Barcelona's La FIRA exhibition complex with the collaboration of the L'Hospitalet de Llobregat municipal mobility department. The promotion of the project will be coordinated by William Rendall.

Interest has already been shown by French and German industrial research institutes and UK and Dutch operators. There is considerable optimism for CHISPA's impact.

New partners are invited to join or invest in the project.

Electric Commuting Motorbike

Marc Barceló
Volta Motorbikes

1. Volta BCN: Our first product

Volta Motorbikes is a young company that believes in electric motorcycles as a transportation solution for the immediate future. Our mission and goal is to provide solutions to help reduce pollution and contamination in big cities, providing clean, efficient, reliable and affordable inner-city transportation.

Nevertheless, Volta Motorbikes believes that ecologic doesn't have to be synonymous of boring, laim or like motorcyclists say, "being decaf". In fact, this company is all about passion for design, performance, good sensations and emotions, all being reflected throughout its products.

Volta Motorbikes present its star project: the Volta BCN. The Volta BCN combines design, a sporty feel, innovation and sustainability all in one. This goes to show that a practical and sustainable vehicle can also be dynamic, while boasting an urban image and high performance. The Volta BCN is different from other urban electric motorbikes, as it combines technology, design and a sporty feel, to afford users the opportunity to experience motor passion while also being respectful of the environment. This motorbike, designed entirely in Barcelona, has received the name of the Catalan capital thanks to an agreement with the City Council, which hopes to display the city's aspiration to become a European benchmark in sustainable mobility and environmental respect.

After months of work and perseverance, the Volta Motorbikes project has now come to fruition and is about to begin the production phase, when funding is found.

2. Technical features

Volta has developed a Battery Back with 3Kwh lithium-polymer cells. Inside this battery pack we can find not only the battery with his BMS , also the motor controller and the Vehicle Management Unit with his diagnosis system (both designed by Volta) , the DC/DC converter to 12V. This configuration has been chosen because it ensures that all components with high voltage are perfectly closed inside a safety box. A diagnostic tool allows us to find any failure inside the Battery Pack by connecting to a USB port placed outside the pack. With a full battery recharge cost of €0.45, this bike can recharge completely in just two hours when plugged into a 220-V household socket or at any public charging point. The Volta BCN has a range of approximately 70 kilometres. After 1,500 charging cycles, which is the equivalent of five years of daily recharges, the battery still has 80% of its initial capacity.

One thing that we must point out about the Volta BCN is the quality of its components, as all of its parts are supplied by prestigious brands in the sector.

The motorbike comes with a trunk with capacity for a full-face helmet, as well as a mobile phone charger. Moreover, it includes wireless technology to connect the users Smartphone with his motorbike (with the Vehicle Management Unit), offering wide range of applications, such as programming time and recharge time, power setting limits and eco mode driving, give you advice about your driving style in order to save energy, among many others.

Cities Demonstrating Automated Road Passenger Transport: CITYMOBIL2

Alberto Peña
TECNALIA

1. Motivation

Automated systems are initially designed to supplement the existing mass public transport system with collective, semi-collective and personal on-demand shuttle services. When demand is low or pick-up points are far apart, they are much more effective than conventional public mass transport systems. Cybercars are operated automatically with state-of-the-art obstacle-avoidance technology in order to run on existing infrastructure among pedestrians, cyclists and road vehicles in low-density areas.

Although these automated systems are being proved in some places, one of the global ideas is that they are difficult to integrate in urban areas because they need a completely dedicated and segregated infrastructure (dedicated lanes).

A real challenge of the system, whose economic and functional potentials are clear, is the combination of automated and manned systems, coexisting together in city public spaces.

2. Project focus

Considering all the points that should be investigated, the project has been structured to get information about the global implementation of the unmanned systems in our daily city environment, taking into account all the approaches to the new concept. In this way, we can consider the real technical problems of a big implementation of the solution, from the experience from different places, as well as functioning along a period of time of sic months.

The existing legal framework is closely related to the solution as nowadays, present legislation does not allow self-driving vehicles on normal roads.

Implementing several demonstration sites will help us to bring information on new needs, which surely will open a market for new companies. When the automated systems are fully installed in cities, apart from the benefits of using clean electric systems, a new generation of services will be required, principally focused on ITC technologies.

Economically considering, the uncertain large-scale effects of a massive use of "Automated road transport systems" on automotive industry will be analyzed with prospective data on real test and prototypes data.

On the human factor side, a long way must be done to educate drivers and road users in the coexistence with unmanned systems, not only to use, but also so live with them. Also during a period of time in most cities the use of unmanned vehicles shall exist with manned ones, creating new problems and situations that now cannot being consider without real test places.

3. Final outputs

The final outputs of the projects will be:

- A fully automated road transport will be running for at least six months at five sites across Europe, also demonstrating possibilities of the solution in showcases in different places.
- Conclusions and guidelines to design and implement systems of automated transport modules in cities downtown, mainly.
- Improved understand of the interaction between automated vehicles and other road users, as well as knowing how to teach drivers to deal with automated systems.
- A legal framework proposal for certifying automated road transport systems in Europe. A completely new transport concept will require a different related legislation.
- Technical specifications for interoperable automated road transport systems, including a communications architecture.

HIDRONEW XXII

Joaquín Chacón
JOFEMAR, S.A.

1. Working on batteries and business models for electric vehicles

Lithium ion is the battery technology used in the majority of the present developments of electric vehicles worldwide. Furthermore, those based on the LiFePO4 cathode material represent the biggest percentage for traction of different types of vehicles (from light to heavy ones). This particular technology has constituted the focus of a battery pack development in JOFEMAR during the past 5 years under its daughter company HIDRONEW XXII.

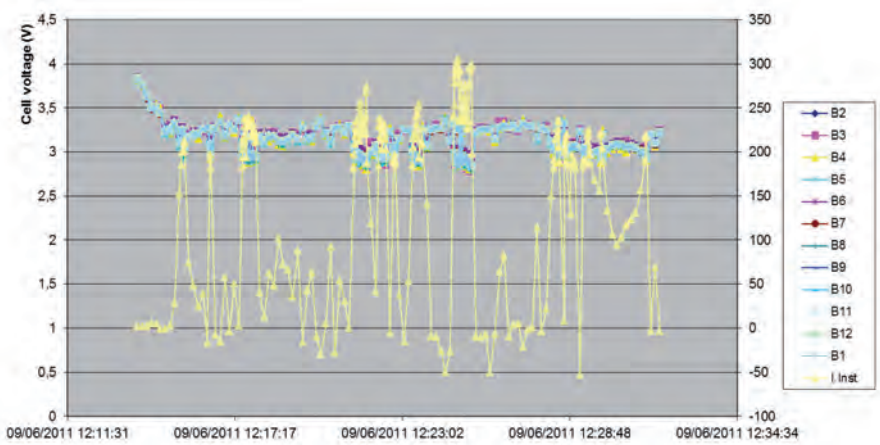
During this period, acquired knowledge on battery management has moved to the company to succeed in the transformation of traditional cars with combustion engines to full electric ones, including the incorporation of the electrical engine (30 kW), the battery (264 V / 100 Ah) with the BMS and the charger and the electronic devices to manage the system. Some successful examples are a VW Polo which already met 28,000 km and is employed in the company to test diverse extreme driving conditions since January 2010 and a Citroen Berlingo in Pamplona city which has covered the maximum range in our experience with almost 50,000 km in 2.5 years.

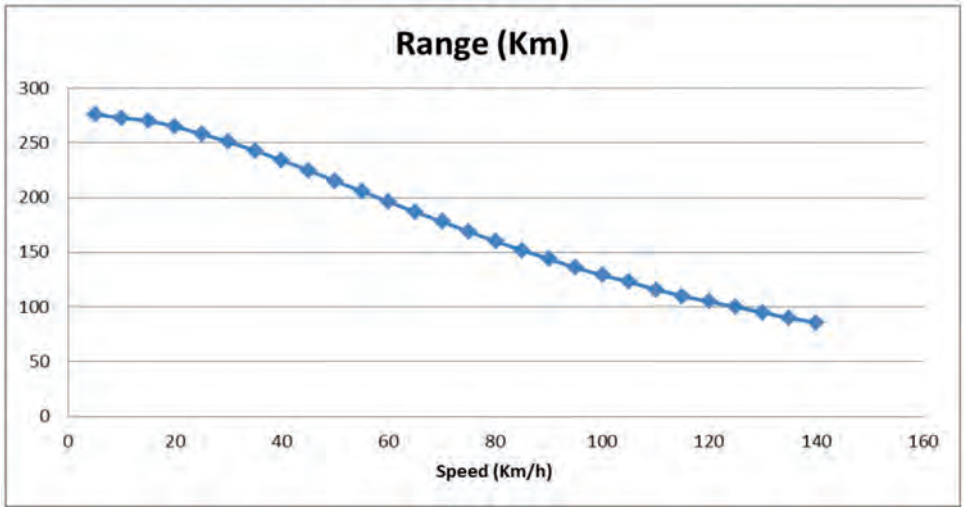
Continuous testing during these years has permitted to understand the evolution of the SOH of the batteries in function of different operational parameters which allows to our engineers to design and program a specific car control depending on the customer requirements. In the next Figure, an example of performance measurements is shown.

Evidently, a good understanding of the battery status evolution during the life of the vehicle, combined with an accurate knowledge of the car behavior as, for example, the autonomy range in function of the speed (see next Figure) or the battery cycle life (more than 3,000 cycles at 80% DOD) offer many tools to develop specific business cases to different customer profiles, making business profitable to electric vehicle suppliers and professional or domestic users in a win-win equation.

2. New approaches to the EV market

With the accumulated experience in design, construction and field tests, HIDRONEW XXII is advancing in the next steps focusing its efforts in strengthening the key learnt aspects in the strategy of being a preferred supplier of electric vehicles.





Two ways are centralizing present efforts in this field in the company which could be described as technology evolution and business model renovation.

Technology wise, the company continues exploring new energy storage alternatives. In this way, it has started in 2012 a project called "Power Flow" to develop a Redox Flow battery based on the Zn-Br electrochemical couple. This battery type presents some advantages versus Lithium ion one, mainly in terms of flexibility of design (energy storage capacity and power are decoupled and can be sized independently) which gives more possibilities to tailor vehicles to specific applications and cost which, today, is one of the main barriers of the deployment of electric vehicles in our cities.

With regards to business models, HIDRONEW has decided to create, produce and sale an own electric car, introducing the last technological advances in the automotive world but without losing the taste of driving in a traditional style. In this way, the company has started a new project in 2013 which will bring new sensations to the car industry while offering futuristic alternatives to electric car users.

The combination of high technology and own development and production processes will allow to HIDRONEW XXII to grow constantly in the electric vehicle market for being one of the main players in this sector and with a good and valued knowledge of this market.

Control systems
Electric-VEhicle Control of individual wheel Torque for On- and Off-Road Conditions (E-VECTOORC)

Javier Orús
Instituto Tecnológico de Aragón

1. Project description

The E-VECTOORC project brings together 11 complementary partners from industrial and research backgrounds to address the individual control of the electric motor torques of fully electric vehicles to enhance safety, comfort and fun-to-drive in both on- and off-road driving conditions. Potential benefits will be demonstrated by:

- The development and experimental testing of yaw rate and sideslip angle control algorithms based on the combination of front / rear and left / right torque-vectoring to improve overall vehicle dynamic performance.
- The development and experimental testing of novel strategies for the modulation of the torque output of the individual electric motors to enhance brake energy recuperation, Anti-lock Brake function and Traction Control function. The benefits of these strategies include reductions in: i) vehicle energy consumption, ii) stopping distance, and iii) acceleration times. The benefits of these strategies include reductions in: i) vehicle energy consumption, ii) stopping distance, and iii) acceleration times.

All developed algorithms will include failsafe strategies and controlled shutdown procedures. The overall control strategy will employ a modular control architecture to allow an easy implementation for different vehicle layouts (e.g., the number of individually controlled motors), vehicle sizes and vehicle applications (from small city cars to sports cars and SUVs).

The activity will be carried out using vehicle dynamics simulations and Hardware-In-the-Loop (HIL) testing of vehicle components and subsystems, which will be complemented by full scale experimental testing of the entire system using a highly versatile vehicle demonstrator that can represent drivetrain architectures with 2, 3 or 4 electric motors. Experimental testing will provide comprehensive information for quantifying the benefits of the proposed control system in both on-road and off-road driving conditions.

Hence, in line with the ICT Work Programme for FEVs, the potential of electric drive architectures for improving vehicle stability control will be more fully exploited and measured through the E-VECTOORC control approach.

2. Participation of ITA in the consortium achievements

During the first two years of the project, the Aragon Institute of Technology has been directly involved in the achievement of the following main outcomes:

- Development of Anti-lock Braking System and Traction Control system algorithms through vehicle dynamics simulations and assessment of their performance through HiL tests including the electro-hydraulic braking system unit.
- Development of Active Vibration Controller for the electric powertrain, and testing on the two-wheel-drive E-VECTOORC demonstrator.
- Development of blending algorithms for efficient distribution of braking between friction and regenerative torques, both in normal braking and in ABS interventions.
- Development of logic for modification of controllers depending on driving mode (Normal/Sport/Eco/Off-road) and cycle (city/highway).
- Simulation of Electric Magnetic Compatibility issues in the electric drive, and test planning for components and complete vehicle (to be performed in year 3).

Motor in wheel for small citycars

Iñaki Iglesias
TECNALIA

1. Motivation

There is in these days a global tendency to investigate in clean vehicles, motivated by reduction of pollution necessity, and as a way to develop new options of mobility. Electric city cars are in this group and they are being tested from all the points of view that can be considered.

One of the future lines of research will lead to new vehicle arquitecture designs, based on the distribution of the propulsion and energy storage systems in different positions along the vehicle.

If we consider the possibility of distributing the weight of electric motors along the vehicles we will be able to use much more internal space in the future, as well as reducing vehicles sizes will be possible. The option of installing small electric motors in each wheel axe, will offer a number of advantages that must be analyzed.

2. Objectives

The main objective is to develop and implement new designed synchronous axial flux permanent magnet technology on a "motor in wheel" concept car.

3. Technical approach

Research has been directed to several groups of challenges. First of all, size and volume of the motor must be as low as possible. Effects of the big mass hanging on the global suspension system obliged to redesign magnitudes, with different working parameters.

Another point of research has been the analysis of the thermal behavior of synchronous permanent magnet axial flow. A thorough study of the motor has been carried out in order to learn the behavior and considering which should be the best ways and design to cool the global system.

Related to this point, a new test has been specifically design, constructed and set to point by INFRANOR to collect experimental data required to model new electric machines.

Preliminary design and manufacture of prototype level 0 for performance evaluation of axial flux electric machine with new housing with air cooling capacity, according to project requirements. INFRANOR has worked on the design of a new housing with cooling capacity and has studied different topologies to cool the heads of stator coils. Furthermore, Infranor studied different types of solutions and resin impregnation to evacuate heat quickly in drivers.

Finally, the system has been installed in an experiment vehicle, DYNACAR rolling chassis to get information not only from laboratory test, but also from real car.

4. Conclusions

An electric car with propulsion by small electric motors directly placed on wheels is possible and will offer many possibilities of new vehicle configuration.

To get operative results, further research is to be done, including new generation material to control and conduct thermal flows.

Results of new propulsion through motor in wheel, open a way to different vehicle control systems that will improve general driving experience.

Battery Pack for SEAT LEON PHEV

FICOSA

1. Introduction

For the VERDE /PVV projects, Ficosa has developed two Battery Packs: one targeting to develop new technologies, and second one adapted to the new SEAT León PHEV. Those Battery Packs includes its electronics control, its cooling system and its specific packaging.

Battery Pack VERDE

Battery Pack PVV

The innovations produced by Ficosa in those projects are:

- The advanced Battery Management System.
- A new cells active balancing concept.
- An advanced Thermal Management System, able to keep the cell under an optimal temperature range in any condition, reacting in a predictable way.
- The packaging, which integrates the battery cells, the Battery Management System and the Cooling System.

2. Battery Management System (BMS)

The Battery Management System is responsible for monitoring the voltage of the set and each of the cells, as well as the charging and discharging process. Therefore, it not only optimizes its performance, but also ensures the safety required for such systems.

Master CPU

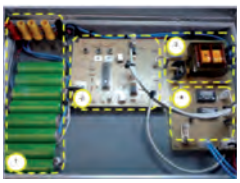
Slave controller

Slave

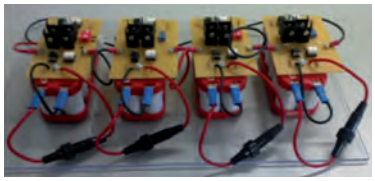
- This Battery Management System is able to Monitor up to 1680 Lithium-Ion cells.
- Passive energy balancing.
- Power Distribution Box included.
- 2 x CAN 2.0b Interface.
- Automotive Grade subsystem (AEC-Q graded components).
- Includes 32-bit CPU (150 MHz, Flash 2 Mb, AUTOSAR SW-architecture).

3. Active balancing system

Two new balancing systems have been developed.



Inductive concept prototype



Capacitive concept prototype

In those concepts, there is a cell or module used to buffer the energy that the most charged cells or modules need to reduce.

4. Thermal management system

Ficosa has developed two Thermal Management Systems: the first is air cooled, the second liquid cooled. Both are able to maintain all cells inside a narrow temperature range (<4 °C in normal working conditions).

Depending on the system, they consist in integrated cooling plates or a fan/ heat sink systems. They are integrated inside the Battery pack packaging and are controlled by the Battery Management System.

The thermal algorithms are able to predict the temperature rise, and request the required cooling system activation in advance.

5. Packaging

PVV packaging has been designed to fit with the new SEAT LEON. The packaging integrates the cell modules, the electronics and the cooling system. The housing has passed several resistance simulations, and a mock up prototype has passed severe Impact and vibration test.

Development of HD Diesel engines by using alternative fuels

Xavier Ribas
Applus IDIADA Group

1. Introduction

Due to its high durability, its high power density, its efficiency and above all its lower specific fuel consumption the diesel engines have been the preferred propulsion source for commercial vehicle applications for decades. Nevertheless, there is current significant interest in converting heavy-duty diesel engines to work with alternative fuels such as NG and LPG not only for having better operative costs but also due to the potential to decreasing or mitigating CO_2 emissions and also the capability to reduce toxic exhaust specific emissions such as smoke and PM.

The aforementioned diesel to alternative fuels engine conversion can be total or partially performed. In the case of total conversion, the combustion system is changed in order to work from Diesel to Otto-cycle; this conversion can include several modifications such as changing the combustion chamber in order to obtain a new compression ratio and introducing spark plugs [1]. In the case of partial engine conversion heavy-duty dual-fuel (HDDF) engine is used [2-4]. A HDDF engine is conceived to simultaneously operate with diesel fuel and a gaseous fuel (Fig. 1), both fuels being metered separately, where the consumed amount of one of the fuels relative to the other one may vary depending on the operation. Two types of technology are considered according to the way of gas injection: High Pressure Direct Injection (HPDI) and the Homogeneous Gas Charge Injection (HGCI).

2. Experimental set-up

The experimental tests were carried out in four direct injection four strokes HD diesel engines for on-highway applications with different performance, total displacement and baseline emission level (Table 1). The engines installations are pointed out in Fig. 2.

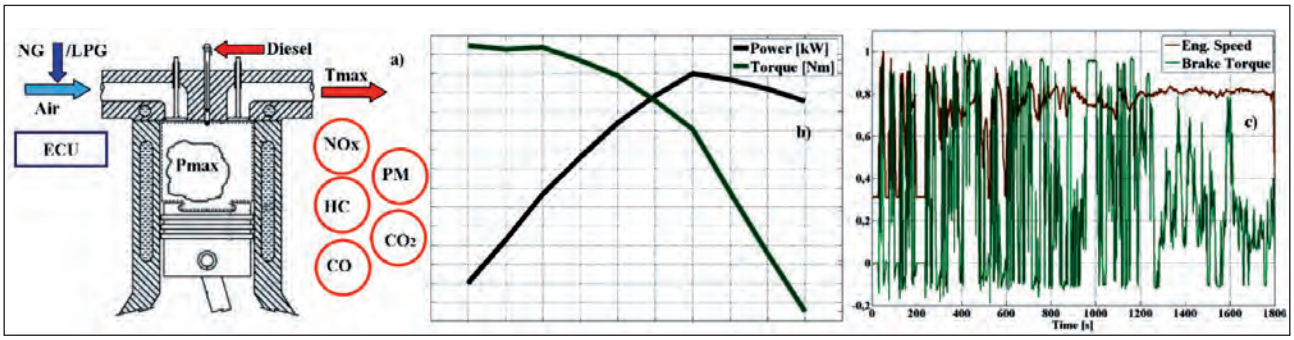


Fig. 1. HDDF engine concept (HGCI): a) emissions and thermodynamics, b) performance, c) transient behaviour.

	Total conversion (NG)		Dual fuel (Diesel+NG)	Dual fuel (Diesel+LPG)
Name	engine1	engine2	engine3	engine4
Intake / Exhaust	VGT / Intercooler	(NA -TC / Intercooler)	VGT / Intercooler / EGR	TC / Intercooler
Configuration	6 in line	4 in line	6 in line	4 in line
Engine displacement [L]	13	4	14	4.25
Power [kW / rpm]	~300 / 1900	(59-84) / 2800	384 / 1800	110 / 2400
Torque [Nm / rpm]	1900 / 1200	(235-350) / 1600	2200 / 1200	520 / 1400
Combustion system	EUI	Pump in line	EUI	Pump in line
Baseline emission level	Euro IV	No standard	EPA 2005	Euro III

Table 1: Main characteristics of the engines studied.

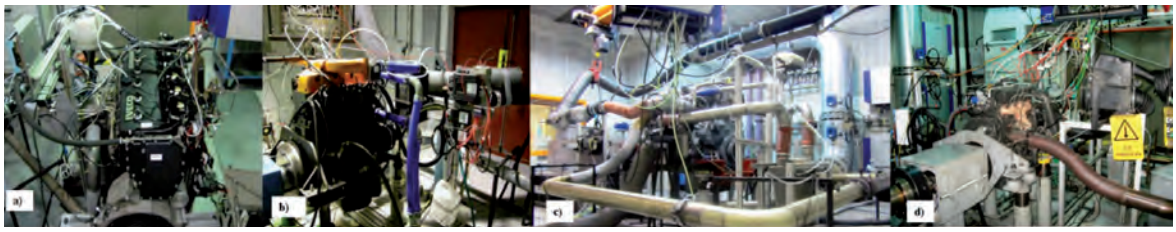


Fig. 2. Engine installation at the test bench: a) engine1, b) engine2, c) engine3, d) engine4.

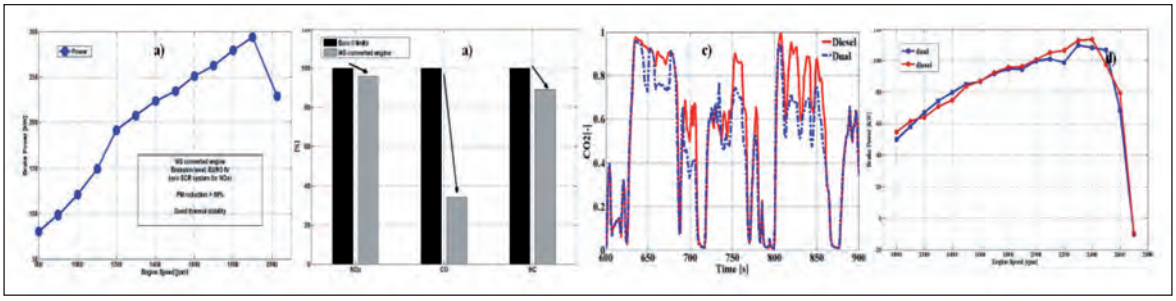


Fig. 3. Results from: a) engine1, b) engine2, c) engine3, d) engine4.

3. Results

Some interesting results from each of the engines studied in this work are shown in Fig. 3: a) final full load curve of NG converted engine1, b) regulated gaseous emission comparison from NG converted engine2, c) CO_2 instantaneous measurement comparison from dual-fuel converted engine3 (diesel+NG) during freeway part of the FTP emission cycle and d) full load curve comparison in terms of power from dual-fuel converted engine4 (diesel+LPG).

4. References

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[4] Stelmasiak Z., Matyjasik M. "Simulation of the combustion in a dual fuel engine with a divided pilot dose", Combustion Engines, PTNSS-2012-SS4-405, pp. 43-54, 2012.

Innovative technologies for the development of a Light Range Extender Vehicle

José Mª López Martínez
INSIA (Univ. Politécnica de Madrid)

1. Background

The automotive industry is beginning to propose alternatives to conventional fossil fuel vehicles. Nevertheless, electric traction still presents the problem of autonomy, even more if we are talking about large size vehicles.

2. Objectives

The main goal of the Project is to develop a light duty serial hybrid large size vehicle from a preexisting platform by fulfilling the following technical objectives:

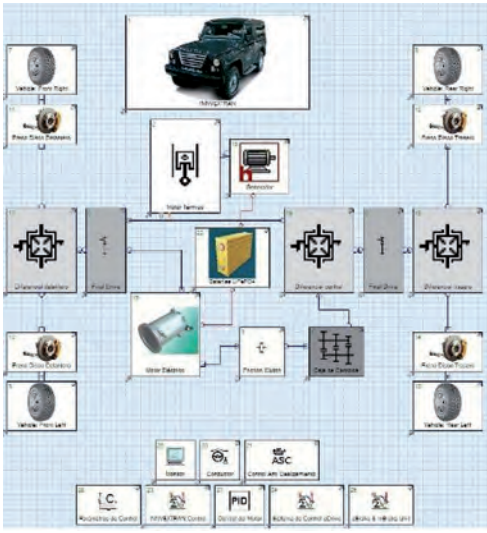
- To develop a hybrid range extender platform for light duty vehicles, both 4WD and delivery usage.
- To develop those tools and methodologies to size hybrid vehicles optimally.
- To define and develop the complete system and its algorithms to optimize hybrid range extender vehicles management.
- To develop and industrialize a range extender 4WD hybrid based on Santana Mahorí, built in Linares, Jaen.

3. Main results

Main Project activities have focused on the analysis of powertrain technologies to get an efficient alternative transport, but also keeping in mind structural and safety issues such as:

- Asynchronous PWM controlled motors, for pure electric traction.
- ICE-Synchronous generator unit, to get an extended range.
- Li-ion batteries power pack.
- Electronic control, network controlled through CAN Bus (SAE J1939).
- Optimization algorithms adjustable for every customer
- Electric ground watchdog.
- Optimized structural design to get the best solution under mass criteria.

As a result, consortium has developed a prototype of a light duty vehicle, electric powered and with a very high range to maintain all features that market needs.



4. Conclusions

Analyzing the growing concerns about the economy and safety on energy supply and air pollution, it is clear that the transition from urban road transportation to the electric propulsion is inevitable. However, this change needs not only consumers' acceptance, but also an update of business models.

This project aims to foster the transition to the future electrification of transport by offering to the market an alternative solution. This project offers to the market the first 4WD range extender professional vehicle being the main target groups public administration, rural companies and mountain public services (firemen, rangers, etc.) that could prioritize the zero-emission vehicles in their fleets to minimize impact on forest, lands and other natural environments.

ONFLEET – Electric Fleet Management System

Jorge León Bello
ITENE - Instituto Tecnológico del Embalaje, Transporte y Logística

1. Background

ITENE has experience in the development of fleet management software and applications for the transport sector. This is the case of the ONFLEET application which allows the monitoring of a number of vehicle parameters (GPS position, speed, engine rpm and fuel consumption and for ICE vehicles, etc.) obtained through the CANBUS interface of the vehicles. CAN bus (for controller area network) is a vehicle bus standard designed to allow microcontrollers and devices to communicate with each other within a vehicle without a host computer. The innovation of the new tool developed by ITENE lies in the application of the ONFLEET to electric vehicles.

2. Technological description

ONFLEET - Electric Fleet Management System - monitors electric vehicle real-time data including the following parameters:

- GPS position.
- Instantaneous speed.
- Electricity consumption.
- Battery level.
- Weight.
- Route gradient.
- Driving hours.
- Stops and starts.
- Temperature.

The data for the analysis are collected remotely without interrupting the daily operations of the company or of the drivers thanks to the CANBUS technology and to the software developed by ITENE. ONFLEET includes an application for electronic cartography which will allows the fleet monitoring in real-time from the control centre of the logistics service provider.

A device is installed in the vehicles in order to periodically obtain the information through the CANBUS interface and in order to integrate this information with the geographical information obtained by means of a GPS existing in the device. The installation is non-invasive, without altering the vehicle manufacturer's warranty.

Fig.1. Concept of ONFLEET Electric Fleet Management System.

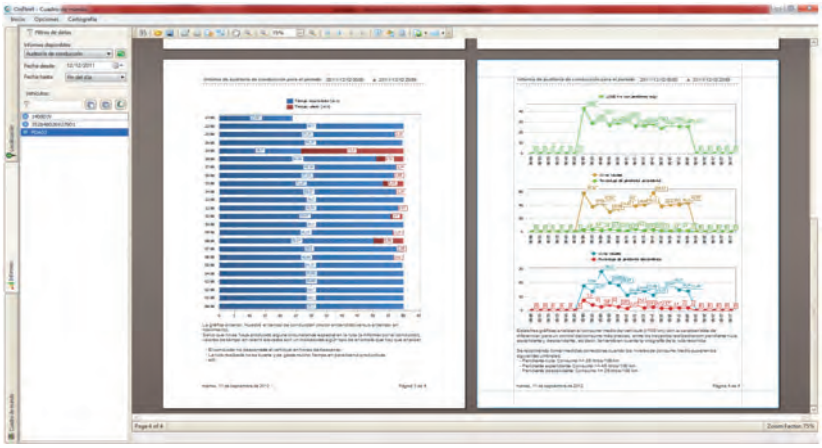


Fig.2. Example of vehicle activity report.

All the information gathered is sent to a control centre by means of a GPRS connection which is also available. All the data is processed and validated in the control centre, and integrated in a database. A computer application dynamically generates reports about the vehicles' performance considering the most representative parameters involved in the use of EVs.

3. Applications

The main functionalities of the tool are:

- Web and desktop application: easy-to-use tool with access from companies' computer
- Real-time vehicle positioning: route optimization with a continuous monitoring of the vehicle autonomy and the battery level.
- Graphical representation of vehicle performance:
  - Effect of temperature on battery range.
  - Effect of route gradient on battery range.
  - Effect of vehicle load on range.
  - Effect of stop-start/urban driving conditions on autonomy.
  - Effect of battery life on vehicle range and power.
- Eco-driving:
  - Effect of driving style in battery performance: regenerative braking.
  - Learning tool for drivers to optimize vehicles' efficiency.
- Warning system informing about aspects such as excessive speed, excessive length of vehicle stop, excessive electricity consumption or level of battery below a certain level.

ONFLEET also allows a comparative study of conventional diesel or gasoline vehicles and electric vehicles in terms of costs, efficiency, productivity, service quality or environmental impact.

4. Potential customers

Among the potential customers of the ONFLEET solution can be mentioned the Logistics Service Providers, the private and public transport companies (for freight and passengers) or others such as the car-sharing companies.

5. Status

ONFLEET - Electric Fleet Management System - is a prototype being tested in the framework of the FREVUE project "Validating FReight Electric Vehicles in Urban Europe" (http://frevue.eu/). The tool tests and upgrades are planned to be carried out between 2013 and 2014.

PPU-SIM: Pay Per Use for a Sustainable Intelligent Mobility

Carlos Moliner
iMAUT

1. Project Information

Budget: 460.000€
Duration: January 2012 – December 2013
Funded by: IVACE – Instituto Valenciano de la Competitividad Empresarial
Coordinator: Carlos Moliner (iMAUT)

2. Motivation and objectives

The objective of PPU SIM Project (Pay per use for a Sustainable Intelligent Mobility) is the development of an in-car pay-per-use functionality. Its perimeter includes the development of the protocols for vehicle-to-payment infrastructure communication, the HMI for passengers interaction and the physical integration of the functionality in the cockpit.

The project will consider two scenarios:

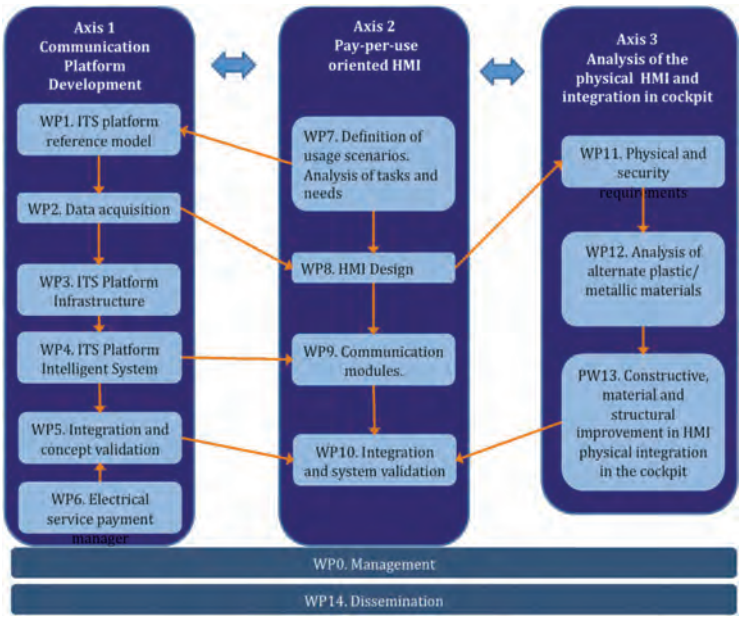
- Payment of recharge in Fully Electric Vehicles or in Plug-In Hybrid Vehicles.
- Payment of access/congestion fee when entering traffic restricted areas.

Once these two scenarios will be successfully developed, the same project can be easily extended to other situations, such as parking fee payment.

The motivations behind the Project are multiple:

- Create a functional solution that will allow the payment of certain services from in-car and in real time, creating a seamless transport solution that will not require previously planned actions from the driver (eg.: paying access fees in advance, quit driving to enquire about the price of an electrical charge at certain moments in the day...).
- Support the development of in-car pay-per-use schemas, clearly positioned as a growing business opportunity in the close future.
- Support a more efficient and user-friendly implementation of access control policies in determined city areas.
- Support a better energy management to recharge the cars, by means of the prices of the energy , and the preferences of the user.
- Research in light and sustainable structural solutions to embed the PPU-SIM equipment in the car.

3. Technical approach



4. Status / Achievements

Each independent module of the project has been developed:

- Communication protocol.
- HMI.
- Charge management module.

Last semester of year 2013 will be focused on the integration and validation of the complete project.

5. Partners

iMAUT (Automotive and Mobility Technology Unit), formed by:

- AIMME (Metal-mechanics technology center).
- AIMPLAS (Plastics and Composites technology center).
- IBV (Biomechanics technology center).
- ITE (Energy technology center).
- ITI (Computer science technology center).

Walkiria: "Real physical demonstrator in an environment with standard and mobile charging stations with energy storage, generation equipments and ICT developments with communications to test and charging optimization algorithms"

Patricio Peral
ITE

1. Objective

The main objective of the WALKIRIA project is to develop an intelligent and complete EV charging management system in a sustainable grid environment.

The system will be based in a new mobile charging station (PREMISA), that may be used in every standardized electric current base linked to a customer contract, to safely identify where and which car is being charged, minimize charging station costs and allow an optimal use of the existing distribution network, deferring further developments oriented exclusively to this purpose and definitely minimizing the costs of the value chain power-mobility-vehicle.

The new intelligent EV charging management system will be supported by a technological platform that will allow all the functions of the charging management, integrating the necessary communications based on standards in order to assure a correct intelligent grid and EV charging operation, also in micro-grid environments with presence of distributed generation and energy storage.

Secondary objectives are:

- Development of software and hardware technology required to integrate mobile charge of electric vehicles in a network with comprehensive management, where local generation is added and the forecasts derived from the model of charging reserves.
- Design and implementation of a management platform of local charges integrating optimization process algorithms and network management functions in real time, that take into account the user preferences to provide optimal charging profiles. This will lead to the contribution of managing a Smart Micro-Grid by suggestions for balance of charging demand with local energy generation and storage, operating in the environment of a local distribution network with renewable energy integration and functionalities of Demand Side Management (DSM) of the aggregated EV charging demand.
- Development of a communication technology platform, supported by cloud computing to perform algorithms on various scenarios to achieve optimal charge management and decrease demand from the network, maximizing the use of local storage and its integration with the core network.

2. Innovation

The innovation of the project lies in the development of a new EV charging management system, intelligent, integrated and communicating with all the stakeholders in the electricity supply system:

- Electrical Distributors (DSO), allowing two-way communication that permits both meet instantaneous demand curve, the available power, and notify connection and a new customer demand (electric vehicle), mitigating the interference created to the system.
- EVSE Operator, who through EV load demand input data and communicating with DSO, implement the optimization algorithms developed for the efficient management of energy, for example by integrating individual charging points, adapting charges to the existing demand profile, etc.

3. Added Value:

- Mobile solution, versatile, with a low reasonable cost.
- Electromechanical safety guaranteed to users and third parties.

- It incorporates all the features of a conventional fixed station and also certified meter and different payment options.
- Two-way communications.
- Allows connection to every authorized load base, exploiting the actual network and existing contracts.
- Develop the new concept of a universal platform , for all the territory, including inventories, all the real loads records and creating the repository for the intelligence of active demand management, and the information exchange among the stakeholders.
- It is a 100% national development, accomplishing international standards.
- Is compatible and complements standard fixed stations.
- Makes easier the mobility, eliminating the range anxiety and risk of load depleting.
- Allowing payment after charging through WALKIRIA payment platform.
- With modules for internal and external communications (TCP / IP connection, GPRS based, OCPP communication with back-office, IEC 61851 compliant for communication with the vehicle, with possible Bluetooth link, RFID or NFC for authentication and payment).
- It has its own intelligent system of recharge management to ensure EV-PREMISA-SIGC, monitoring online load.
- It uses an optimized wireless connection system with the load manager.
- Integrates the SIGC with a system of demand active management (GAD).
- Incorporates the inventory of bases authorized, PREMISAS, EV and all the real charges.
- Transforms the charge in the core operating system, ensuring communications and interaction with other actors involved (the vehicle owner, customer , utility distribution, National Grid, for the optimization of the load curve).

Capturas, telematic platform for connected vehicles and smart mobility

Lluís Olivet Cos
OTCengineering

1. Introduction

From OTCengineering, we are convinced that the future of mobility are focused in the connected vehicle and smart mobility, this is the reason why OTCengineering invests in developing products and solutions to connect vehicles and facilitate smart mobility since 2009.

At OTCengineering our daily duties are focused in create exclusive products and solutions which resolves the connected vehicle requirements on the Smart Mobility growing market; products and solutions which are focused in facilitate business development by creating new opportunities and to increase and reach new market share. OTCengineering generate those products which are addressed to solve the present and the future of the Smart Mobility market requirements and user demand; products which are addressed reach new mobility concepts and greater opportunities for efficient and sustainable mobility.

Innovation and technology are the basis of our company, where our team creates the real state of the art connected vehicles, basis in which our proprietary telematic platform named, CAPTURAS had born.

2. CAPTURAS platform

CAPTURAS are the telematic platform solution from OTCengineering, build to address the present and the future requirements of the connected vehicle and the Smart Mobility. CAPTURAS is a modular and customizable platform which enables that any type of vehicle, can be connected to the world by closing the circle and connected the vehicles through infrastructure and mobile devices (tablets and smartphones).

Thus by using CAPTURAS, we are able to create new applications, products and solutions addressed to Smart Mobility markets. Products and solutions developed to create new mobility concepts, to simplify user accessibility, while creates unique user experiences, facilitates mobility management, and makes the mobility more efficient; things that generate grate opportunities to develop and expand the business in the smart mobility market. Solutions addressed to satisfy users demand to achieve more sustainable and efficient mobility. These are the cases of the current products based in CAPTURAS platform, which are commercialized:

1. Efficient management of mobility: solution to simplify mobility management, making it more efficient and

sustainable while reducing costs and increasing vehicle productivity; goals achieved by gaining access to real vehicle data.

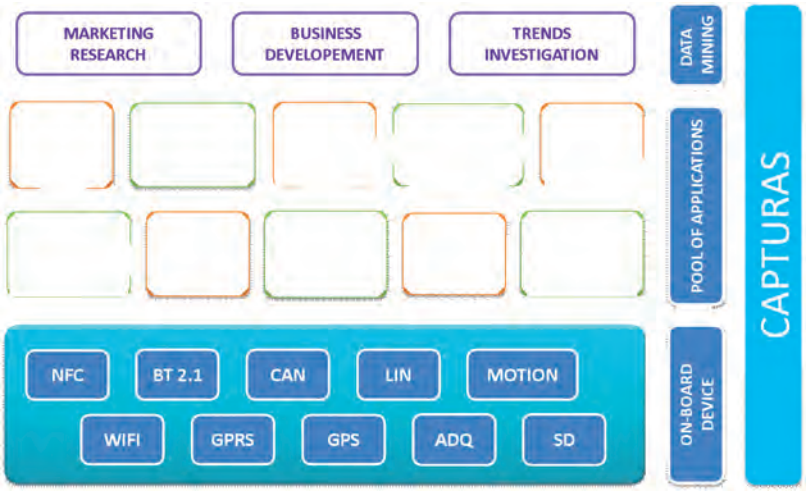
2. Keyless sharing 3.0: unique and smart solution for mobility sharing. Fleet operators, peer to peer platforms and corporative fleets, have the opportunity to explore new business opportunities, gaining access to new market share, and increasing vehicle productivity. Keyless sharing 3.0, provides a unique, smarter and simple user experience, with a real time booking system, from everywhere at anytime: find, book and use a car with a real pay per use system. All in-one, achieve a complete transaction from smart device (tablet or Smartphone) <http://youtu.be/Jgz_Gzv7-ik>.
3. Next generation of in-vehicle infotainment: the authentic in-vehicle connectivity and exceptional user experience, which allows the driver to use its tablet or 2x1 computer inside the vehicle, in a secure and reliable way. Imagine a way that you can manage your mail, personal agenda, social network, etc while driving a car; users can achieving it, in a secure and reliable way by connecting its tablet or 2x1 computer to the car.

3. CAPTURAS characteristics

CAPTURAS is a modular, scalable and customizable platform, based in 3 levels of products which provide a complete added value solution for the connected vehicle and smart mobility. Three level of products where each one solves the desires of connectivity to provide a complete and powerful solution.

4. Conclusions

CAPTURAS is an off the shelf modular platform for real vehicle connectivity, addressed to solve the user demands on the smart mobility. CAPTURAS is the catalyst to achieve successful business development and new market opportunities for smart mobility companies.



On-Board device: provide real vehicle connectivity, allowing it to communicate from and to the outside by using standard technologies (WiFi, NFC, BlueTooth, etc).

Applications: modular applications developed in CAPTURAS platform, which allows the creating of unique CAPTURAS solutions for the smart mobility.

Data mining: achieve big data to reach powerful information and manage the business, new opportunities and marketing trends.

e-DASH' E-Mobility Broker

Andrea Rossi
ATOS Research & Innovation

1. Introduction

The massive implementation of Electric Vehicles in Europe needs support from ICT system; therefore technological trends, best practices, standards and regulations must be taken into account for a sustainable solution. e-DASH aims at the harmonization of electricity demand in Smart Grids to manage a sustainable integration of electric vehicles. This is addressed by an intelligent charging system supported with near real-time exchange of charge related data between EVs (Electric Vehicles) and the grid. e-DASH faces the challenge of development ICT tools focused on balancing energy availability in the grid, which also means the improvement of charging/discharging processes for EV. This is made though intelligent systems, being the e-Mobility Broker one of the modules in the full required architecture.

2. E-Mobility Broker Definition

The E-Mobility Broker (EMB) is the entity and associated system that allows managing the offering energy demand and supply, scheduled energy consumption plan, forecasts of load profile and balancing area maps information. The E-Mobility Broker notifies energy demand to Balancing Responsible Party (BRP) and power supply to the e-DASH OEM Back-End, which represent also the Fleet Manager (FM). The EMB is likewise considered as a Commercial Virtual Power Plant (CVPP), which is an aggregator of CVPPs because it is able to manage several OEM Back-Ends that also represent a set of a FM or CVPP. The E-Mobility Broker provides information regarding Balancing Area (BA) locations to CVPP (Fleet Manager) and information on energy demand and supply of the Balancing Areas (BA) locations to the OEM Back-End. EMB also receives charging and discharging capacities data from CVPP per BA, getting or receiving event or notification about the basic charging and discharging capacities information. Consequently, the E-Mobility Broker is not only considered an aggregator for charging and discharging needs for BA, but also a collector of data related to charging and discharging requirements for a set of Balancing Area. Additionally, the EMB manages the decomposition of BRP schedules for CVPP through a disaggregation process. In summary, the E-Mobility Broker manages the relationship between BRP schedules, the BRP manages and provides a plan of schedules for the forecast of the energy consumption and supply and the e-DASH OEM Back-End provides the forecasts of load profiles optimized and applied by the Fleet Manager. All of this taking into accounts the corresponding BAs where specific areas could need more or less energy than predicted. Moreover, E-Mobility Broker is responsible for distributing eligible tariff information to relevant actors, based on the information provided by E-Mobility contractors. Finally, the EMB can be considered to manage services and data in the scope of covering HUB functionalities which allow multiple external entities to communicate (service and data) between all others through a platform which can coordinate, orchestrate, adapt, process, compute, transform, distribute and dispatch the information to each actors or entities allowing and ensuring an high level of interoperability with other services or entities.

3. E-Mobility Broker Applications

Day ahead forecast: EMB performs the services to manage reception, validation and classification of the Day ahead forecast received from the OEM Backend. The information is classified, stored and, finally aggregated in a suitable forecast that is send to the BRP. Balancing areas, OEM Backend and time are required for the aggregation process. Global Load Profile: EMB is responsible for manage reception, validation and classification of the Global Load Profile (GLP) send by the BPRs. The next step is execute algorithms to disaggregate the GLP and prepare the Day ahead Load Profile (DaLP) by Balancing Area, OEM Backend and charging period time; and storage the results in a secure and configurable storage. Finally, EMB execute the services to send the calculated DaLP to OEM Backend requester. Intraday flexible demand: The EMB performs the services to manage the

reception and validation of request for Current energy demand received from the BRP and storage them. Once disaggregated, next steps are sending the request the respective OEM Backend, receive response from the OEM Backend and, once aggregated, send it to the BRP. Updated intraday load profile: The EMB also is responsible for managing the negotiation process between the BRP requester and the target e-Dash OEM Backend. The process starts with the reception of a Proposal for Update send by the BRP. Once stored, the EMB executes the algorithms and disaggregation required and sends an Updated intraday load profile to the target OEM Backend. Once accepted by the EOM Backend, the EMB sends the negotiation results to the BRP and finishes the process. Balancing Areas: To ensure a coherent use of balancing areas, EMB is also responsible for managing Balancing Areas Map. This information is received from each BRP. Once aggregated the Bas they are stored internally. This aggregation is a continuous process for each Balancing Area. Finally the EMB manages the request of information about Balancing Area Map received from the OEM Backend.

EMERALD: Energy ManagEment and RechArging for efficient eLectric car Driving

Roberto Giménez
HI-Iberia Ingeniería y Proyectos

1. Abstract

EMERALD is a European research Project funded from last FP7-2012-ICT-GC call in end of 2011. It has recently held its Kick Off Meeting in the city of Genoa. The Project consortium is composed of 13 European entities, from which 4 of them are Spanish (Telvent, Tecnalia, HI-Iberia and Comarth). During 3 years they will be working together for a successful completion of the action.

EMERALD focuses on energy use optimisation and on the seamless integration of the FEV into the transport and energy infrastructure, by delivering clear advances over the state-of-the-art. The goal is to assist the FEV in becoming a successful commercial product.

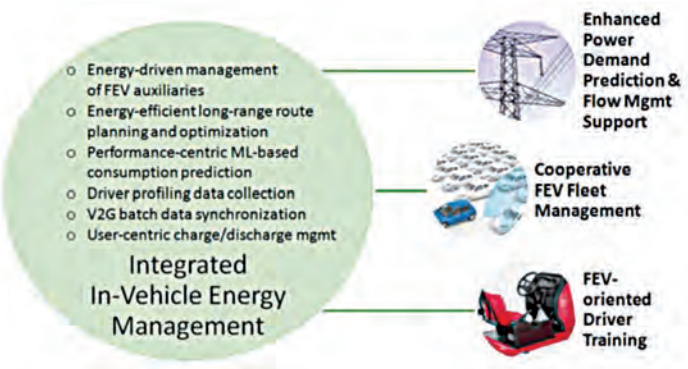
2. Methodology

To this end, EMERALD will innovate a range of novel ICT solutions, each one seamlessly integrated with the others, providing a multifaceted and comprehensive approach on these issues. EMERALD will introduce Integrated in-vehicle energy management, comprising:

- Dynamic energy-driven management of FEV auxiliaries, tightly integrated with consumption prediction functionality, enabling pre-emptive energy conservation measures.
- Energy-efficient long-range route planning and optimisation, enabling extension of FEV's driving range and automatic scheduling of recharging stops en route.
- Performance-centric machine learning for consumption prediction, introducing optimisation and cooperative training of machine learning functions targeted for energy consumption and traffic prediction based on experience.
- Driver profiling functionalities, through monitoring of acceleration/braking patterns, for the enhancement of route consumption prediction functionality.
- V2G traffic and consumption data synchronisation, as a new cooperative information-sharing scheme.
- User-centric charge and discharge management, enabling automatically-generated, optimal for the user, charge and discharge schedules, accessible both on-board and on his mobile phone.

EMERALD will also introduce: Enhanced FEV-related power demand prediction and power flow management support, taking advantage of consumption patterns as shared in a cooperative manner by the FEVs themselves, as well as from FEVs' recharging bookings; Cooperative FEV fleet management, though holistic and dynamic, multi-parameter, fleet control optimisation, taking into account energy and recharging limitations; and FEV-specific driver training for energy efficiency.

Following image shows the pillar functionalities of EMERALD:



3. Validation

EMERAL will carry out two large proof of concept trials in order to validate the Project results.

First is foreseen in the Italian municipality of Lucca. It medieval urban center is actually served by a FEV vehicle fleet belonging to the municipality. This fleet will be used in order to validate the cooperative sharing technologies and the efficiency of the machine-learning algorithms.

The second trial will be carried out in the Basque Country, in Spain, and will serve as a validation of the efficient long-route planning and automatic scheduling of recharging points en route.

The Project webpage is actually under construction. A referral (outdated in the partners section) an be found in:

http://cordis.europa.eu/projects/rcn/104152_en.html

Directory of eco and electromobility projects

PROJECTS		Road Transport Electrification					Heavy duty vehicles	Logistics, co-modality and ITS technologies			Others		
	Code	Energy storage systems	Drive train	Vehicle integration	Infraestructure integration	Transport system integration		Logistics	Co-modality	ITS	Alternative fuels (Biofuels, Hydrogen)	Materials	Production technologies
3EV	R	●	●	●									
Adam	N									●			
Amitran	E									●			
ANT	P	●	●	●	●	●				●		●	●
Batteries 2020	E	●											
CARMEN	N	●			●								
CATCH	E										●		
Charging Station	P				●	●							
Citymobil2	E				●								
CO_2Free	E					●							
CO3	E					●		●	●				
Cosmo	E									●			
COVE	N			●		●				●			
CRAVE	P	●			●								
Cuadrinwheel	N		●										
DER	R				●								
DHEMOS	R	●			●	●				●			
DOMOCELL	N	●		●	●	●	●	●		●			●
eBIKE	R	●	●	●									
EBORN3	P	●	●	●									
Ecabstar	R	●	●	●									
EcoGem	E			●		●				●			
ECOLOGICAL CAR	R											●	
eCoMove	E					●							
ECOSHELL	E											●	●
ECUFAST	R			●									
e-DASH	E			●	●								
EE-VERT	E	●		●									
EFRUD	E					●		●		●			
E-Light	E			●								●	●
ELVA	E	●	●	●								●	
ELVIRE	E	●			●	●							
EMERALD	E			●	●	●							
eMOCIONATE	R				●	●				●			
Eunice	E		●									●	●
eVADER	E					●							
E-VECTOORC	E		●	●									

PROJECTS		Road Transport Electrification					Heavy duty vehicles	Logistics, co-modality and ITS technologies			Others		
	Code	Energy storage systems	Drive train	Vehicle integration	Infraestructure integration	Transport system integration		Logistics	Co-modality	ITS	Alternative fuels (Biofuels, Hydrogen)	Materials	Production technologies
EVIC	R					●							
Fast In Charge	E	●											
FGCSIC	P	●			●	●					●	●	
FOTsis	E			●	●	●				●			
FREVUE	E	●		●	●	●							
G4V	E				●								
GCED	E	●	●	●							●	●	●
GeM	E	●			●	●							
GINA	E					●				●			
GREENLION	E	●		●								●	●
HBC	P					●				●			
HINTERPORT	E							●	●	●			
HIRIKO	N/R		●	●		●							●
i-COPILOT	N			●		●							
ICT4EVEU	E				●								
ID4EV	E		●	●									
IEB	R	●	●	●		●				●		●	
IMCIS	R					●		●	●	●		●	●
INNELBUS	N	●	●	●		●	●					●	
INT-CARSVAL	R				●	●							
LABOHR	E	●										●	
LearnForm	E												●
LivingCAR	R				●	●							
M2IA	P		●	●									
MARS-EV	E	●										●	●
MERGE	E	●		●	●								
µDiesel	N/R		●				●						
MOBI2GRID	E			●	●	●							
Mobinet	E				●					●			
MONDRAGÓN VE-RE	E/N/R		●	●		●						●	●
MOVELE	N				●	●							
MOVILOC	P				●	●				●			
M-Rueda	R		●									●	●
MUGIELEC	R	●		●	●	●							
OASIS	N			●	●	●				●			
ODIN	E	●											
OPENER	E	●	●	●									

PROJECTS		Road Transport Electrification					Heavy duty vehicles	Logistics, co-modality and ITS technologies			Others		
	Code	Energy storage systems	Drive train	Vehicle integration	Infraestructure integration	Transport system integration		Logistics	Co-modality	ITS	Alternative fuels (Biofuels, Hydrogen)	Materials	Production technologies
OPTIBODY	E			●									
OPTIVE	R		●	●									
POWER	N	●	●	●	●								
POWER FLOW	N	●											
PRO-E-BIKE	E					●							
PRT Miramón	N									●			
QUICK	P	●			●								
RETROFIT	R			●			●						
REVE	N				●								
SIRVEAC	N				●								
smartCEM	E					●							
SmartCity	N	●			●	●							
SMART EV-VC	E	●	●	●	●	●							
SMARTV2G	E				●	●							
SOMABAT	E	●										●	●
STABLE	E	●											
SURTIDOR	N	●			●								
TECMUSA	N	●	●	●	●	●	●					●	
TRANVIA-H2	R	●	●	●			●				●		
T-TRANS	E				●								
UNPLUGGED	E		●		●	●							
URBAN CAR	R					●						●	
urbóTICa	N									●			
V2M	P	●			●								
VELEX	N	●			●								●
VELIV	P		●	●		●				●		●	●
VERDE	N	●	●	●	●								
VICTORIA	N	●	●	●	●	●				●			
VOLTA	R	●	●	●									
XeV	E	●	●	●									
Z2A	N/I	●			●	●							
ZEM2ALL	N/I	●			●								
ZeEUS	E				●		●						

3EV
Energy efficiency for electric vehicles

Project Information:
Budget / Funding: 1.056.535,76 €/316.960,73 €
Duration: 06/2010 - 06/2012
Funded by: ACC1Ó - Nucli col·laboratiu (FEDER)
Webpage: None

Coordinator:
Salvador Ruíz, Product Manager, Commercial Vehicle
Applus+IDIADA
e-mail: sruiz@idiada.com

Motivation and objectives

IDIADA has developed a full electric truck to meet immediate electric vehicle needs. The vehicle designed was targeted to meet payload, thermal comfort, safety and vehicle range.
Autonomy is a key factor in electrical vehicles.
The purpose of this project is to develop different energy efficiency strategies for electric vehicles.
The full electric truck developed by IDIADA will be used as base vehicle for this purpose.

Technical approach

The points were the strategy will be developed are the following

- Energy harvesting:
  - Regenerative braking strategy (IDIADA).
  - Thermal energy recovery (IDIADA).
- Efficiency energy use:
  - Propulsion improvement strategy (Tecnotrans).
  - Charge strategy (Cinergia).
  - Mathematical model generation of the battery life cycle (Cinergia).

Status / Achievements

Ongoing activities:

- Energy analysis of the base vehicle (IDIADA).
- Thermal gradient analysis (CETEMSA).
- Mechanical reduction gear optimization (Tecnotrans).
- Efficient regenerative braking algorithms (IDIADA).

Partners

IDIADA, TECNOTRANS, CINERGIA.
Subcontractors: CETEMMSA, IREC.

Adam

Desarrollo de Automatización para movilidad Autónoma

Project Information:
Budget / Funding: n/a
Duration: 2011-2014
Funded by: CDTI / INNPRONTA 2011-2014
Webpage: n/a

Coordinator:
Francisco Navarro
Boeing
e-mail: francisco.a.navarro2@boeing.com

Motivation and objectives

In recent years, a genuine technological revolution is taking place with the proliferation of unmanned/autonomous vehicles in all mobility domains (air, sea, underwater and terrestrial), which promise unprecedented benefits (among which, the creation of new market niches) while, at the same time, pose a variety of major problems of any kind, legal/regulatory, scientific-technical, conflict with the status quo, etc.
This situation is driving significant efforts in R&D in countries with greater industrial capacity and technological position in a race to seize the opportunities that the pressing need for change anticipate. The rapid technological development along with the enormous increase in scientific knowledge and industrial property being taking place in conjunction with the global economic situation, sooner than later, will foster disruptive changes in many facets of the economy, in particular, transport, environment and safety.
The ADAM project (Automation Development for Autonomous Mobility) is a cross-domain initiative led by Boeing Research & Technology Europe in consortium with key Spanish companies, universities and R&D centers and co-funded by the Spanish Centre for the Development of Industrial Technology (CDTI), whose aim is to develop critical technologies for autonomous mobile systems.
Within the project's Terrestrial Domain (there are also Aerial and Maritime), Tecnalia, partners with AZKAR, Maser, Ficosa and Elecnor-Deimos to develop technologies for autonomous ground vehicles, such as and communications solutions, perception algorithms and control systems. EVs are used along with novel technology concepts to test and study a couple of use cases of great potential of future commercial application: Personal Rapid Transport (PRT) without infrastructure-based solutions and trucks' convoy platooning.

Technical approach

Different new technologies will be developed and used in the project: New algorithms, high capacity communications, new control logic, and connected control centers.
New design tools and operative simulations systems are being used as well as high complex systems integration.

Partners

Boeing, Indra, Navantia, Elecnor, Centum, Insa, Saes, Ficosa, Maser Mic, Azkar, Tecnalia.

Amitran

CO_2 Assessment Methodology for ICT in Transport

Project Information:
Budget / Funding: 2.63 M€ total budget (1,9 M€ EU contribution)
Duration: 1/11/2011 - 30/4/2014 (30 months)
Funded by: FP7
Webpage: www.amitran.eu

Coordinator:
Txomin Rodríguez
TECNALIA
e-mail: txomin.rodriguez@tecnalia.com

Motivation and objectives

Amitran will develop a methodology to estimate well-to-wheel CO_2 reductions achieved by ICT applied to the transport sector, or Intelligent Transport Systems (ITS).
The Amitran project will define a reference methodology to assess the impact of intelligent transport systems on CO_2 emissions. The methodology shall be used as a reference by future projects and covers both passenger and freight transport through a comprehensive well-to-wheel approach. Different modes are addressed: road, rail, and shipping (short sea and inland navigation).
The top of European transport R&D institutes have bundled forces to cooperate in Amitran. There will be cooperation with recent and ongoing European projects where ICT applications and tools are developed which potentially contribute to CO_2 reduction.
Objectives:
The Amitran project aims to "connect the dots" by developing a reference methodology to correctly estimate well-to-wheel emission reductions achieved by information and communication technologies (ICT) applied to the transport sector, known as "intelligent transport systems" (ITS).
Specifically, Amitran aims to:

- Develop a CO_2 assessment methodology for ICT measures that includes multimodal passenger and freight transport and takes into account the whole chain of effects (from user behavior to CO_2 production).
- Design open interfaces for models and simulation tools implementing the project's methodology.
- Establish a generic scaling up methodology and publicly available database with statistics to translate local effects into the European level.
- Validate the proposed methodology and its implementation using data available from other projects or studies.
- Produce an online checklist and a handbook that can be used as a reference by future projects.

Status / Achievements

On going project.

Partners

DLR, ECORYS, ERTICO, PTV, TEAMNET, TECNALIA, TNO.

A.N.T
Autonomous No-emission Transportation

Project Information:
Budget / Funding: 7.500.000 €
Duration: 36 month
Funded by: Private
Webpage: http://www.inta.es/pistas

Coordinator:
Ricardo Chicharro
National Institute for Aerospace Technology (INTA)
e-mail: chicharro@inta.es

Motivation and objectives

MOTIVATION: In Today's transportation, the driver has full responsibility while driving; In future transportation, the autonomous driving is a key factor, in order to reduce human factor and to move in a more efficient way.

OBJECTIVE: To develop an autonomous mobility system without drivers, its main purpose is to transport people, 24 hours a day, enabling its users to demand its service. The project consists of 10 vehicles + 1 prototype, to be delivered in 24 months to a final private customer; if the offer is approved, communications, development, prototypes, installation of control room, modification of infrastructure and plug in points , shall be carried out in 3 years.
The vehicle must reach the desired waiting spot, automatically open the door, inform the new user of the absence of driver, close the door and drive to the desired destination. Upon the arrival, the vehicle must inform of the arrival, open the door and wait for the passengers to leave the vehicle. After a service, the vehicle should wait for new orders: to wait, to do a new transportation service, or to go to the battery charging station.

Technical approach

Systems and technologies to be developed:

- Command and Control room (PMC) and communications between vehicles and Infrastructure.
- Vehicles: With a capacity of 9 people (seated) and an autonomy of 100 km (include batteries).
- Obstacle Detection Systems (Intelligent systems to identify and avoid unforeseen obstacles).
- Automatic guidance system (Braking and steering systems).
- Automated Tracking and Location systems.
- Integration and control.
- Project management and customer certification:
  - Test specification.
  - Test in proving ground simulating real traffic conditions of the units prior to delivery.
  - Validation of results.

Status / Achievements

The project has been defined, as well the architecture of the systems, the functioning mode, and the technologies to be embraced have been chosen.

Partners

- INTA (Instituto Nacional de Técnica Aeroespacial).
- CEIT, Universidad de Navarra.
- Instituto de seguridad de vehículos automóviles (ISVA), Universidad Carlos III.
- TECNALIA.
- Centro de Automática y Robótica, CSIC.
- FICOSA.
- HIRIKO.

Batteries2020

Towards Realistic European Competitive Automotive Batteries

Project Information:
Budget / Funding: 8,4M€/5,9M€
Duration: Sept 2013-Aug 2016
Funded by: DG Research - Large
Webpage: http://www.batteries2020.eu

Coordinator:
Dr. Igor Villarreal
IK4-IKERLAN
e-mail: ivillarreal@ikerlan.es

Motivation and objectives

The initiative is seeks to develop electric car batteries that have a greater capacity, are longer lasting and more dependable. In addition, it anticipates reusing the batteries as accumulators for renewable energies, once they can no longer be used for automotive purposes.

- Cost-effective chemistries (expected 40% cost reduction in Generation 3 materials).
- Understanding EV lifetime performance -> optimised control strategies and battery size.
- Increase battery residual value through second life applications.

Technical approach

The project approach is based on three parallel strategies:

- highly focused materials development;
- understanding ageing and degradation phenomena; and,
- routes to reduce battery cost.

The project will improve cathode materials based on nickel/manganese/cobalt (NMC) oxides. Such materials have a high chance to be up-scaled and commercialized near-term. Only then, cell development efforts can be translated from pilot to mass production, a prerequisite for qualification in the automotive industry.
Batteries2020 will start with state-of-the-art cells and will develop two improved generations of NMC materials and cells towards high performance, high stability and cycleability.
A profound understanding of ageing phenomena and degradation mechanisms can help to identify critical parameters that affect lifetime battery performance. This identification helps effectively improving materials, system and the development of materials selection criteria. However, ageing and degradation mechanisms have multiple reasons and are complex. We propose a realistic approach with a combined and well organised consortium effort towards the development of robust testing methodology which will be improved in several steps. Combined accelerated, real tests, real field data, post-mortem analysis, modelling and validation will provide a thorough understanding of ageing and degradation processes.
Battery cost is a major barrier to EV market. Second life use can reduce battery costs. We will analyse the potential for reusing and recycling batteries for providing economic viable project outputs.
Our consortium combines a wide range of expertise from materials development and battery production to lifetime characterization, viability and sustainability of the chosen approach.

Status / Achievements

The project kicked off in Mondragon, Spain, on September 24th 2013 with a workshop on industrial technologies, requirements and solutions for Electrical Energy Storage.

Partners

IK4-IKERLAN (Coord), UMICORE, LeClanché, Centro Ricerche Fiat, Abengoa Research, RWTH Aachen University, Vrije Universteit Brussel, Aalborg University and Eurobat.

CARMEN
Mobile charger for national electromobility

Project Information:
Budget / Funding: 1.852.731,00 €.
Duration: (11/2012-12/2014)
Funded by: Proyectos de I+D en Cooperación Nacional CDTI

Coordinator:
Xavier Castells
RACC
e-mail: xavier.castells@racc.es

Motivation and objectives

VEHICLES. Electric Vehicles (EVs) are yet on the streets, probably coming slower than initially expected, but definitely to remain in the market as a new option for the consumer.
Almost all the vehicle brands have proposals for electro mobility, already in the market or under development to be ready in the short term.
EV sells are expected to grow in the incoming years.
EVs have a limited range.
CHARGING INFRASTRUCTURE. In Spain the network of charging points is very limited and its growth is expected to be slow, both for standard and quick-charge solutions.
CONSUMERS. EVs are a cultural change for the consumer, who is now requested to check carefully the remaining range of the vehicle and the nearest charging facilities. Those new aspects may cause a "range anxiety".
Currently the RACC members and clients call us when running out of petrol. The new EV owners will call us when the vehicle will be out of battery in the roadside.
OPPORTUNITY: To provide to RACC members and B2B customers the chance to continue the journey in case that the EV has no enough power to reach the nearest charging point, thus reducing the "range anxiety".
GOALS

- To build a new RACC patrol vehicle with an onboard EV charging system capable to provide some additional range to reach the nearest charging point. The new system has to be efficient in such a way that it can be integrated in an mobile hybrid platform to ensure autonomous regeneration.
- To place the RACC in a competitive and innovative position towards the challenging new assistance requirements of the EVs.

Technical approach

- In order to be able to give service to as many different EVs as possible the possible charging interface should contain: Schuko plug (e.g. for electric scooters), Mode 3 charging 1P and 3P for most electric vehicles and CHAdeMO interface.
- No local CO_2 emissions shall be emitted when charging the customer's battery and during the roadside operation the patrol battery may be self charged by regenerative energy.
- (overnight) recharge of patrol battery via plug-in interfaces.
- Desired fall-back procedure for battery charging via the ICE generation.

Status / Achievements

EV users' requirements and needs concerning roadside assistance.

Partners

RACC, CIRCONTROL, APPLUS IDIADA.

CATCH
Carbon Aware Travel Choice

Project Information:
Budget / Funding: 1.5 M€
Duration: August/2009 - January/2012
Funded by: EU – STREP
Webpage: http://www.carbonaware.eu/

Coordinator:
Marta Sedano
SICE S.A. (Sociedad Ibérica de Construcciones Eléctricas)
e-mail: msedano@sice.com

Motivation and objectives

CATCH (Carbon Aware Travel CHoice) is a project with the ultimate aim to reduce the carbon dioxide emissions of the urban transport sector by encouraging carbon-friendly travel choices.

Technical approach

The CATCH project started with a thorough grounding process lead by researchers at the Centre for Transport and Society at the University of West of England, to address the impacts of climate change on transport related behavior, and how this will affect information-provision.
CATCH will develop and disseminate an online knowledge platform aimed not only at decision-makers, but also at citizens, businesses, planners, and other mobility stakeholders in cities.
The platform will provide examples of best practices, information to promote awareness, tools to encourage the use of greener modes of transport, and a tool to personalize the possible travel-related CO_2 reduction for the visitor to the site.
There are five cities that are actively involved in the CATCH project: these cities are Core Interest Group members who are interested in greenhouse gas reduction strategies for the urban transport sector. These cities will provide invaluable input to the project in helping to design and test the knowledge platform. The five cities involved are: Baia Mare (Romania), Lisbon (Portugal), the London Borough of Hounslow (UK), Odense (Denmark) and Rotterdam (Netherlands).

Status / Achievements

An interest group has been set up to help define the development and direction of the CATCH knowledge platform. The Interest Group consists of representatives of local governments across Europe, the NGO sector, business sector, and research arena in the fields of carbon and environmental management and transport.
In parallel to Interest Group meetings, Green Business Design Workshops are being held to review potential approaches to exploiting the behavioural change triggers required to bring about carbon-friendly travel choices.
The project is commencing its final validation phase with the life launch of the first version of the platform.

Partners

MRC McLean Hazel (Coordinator), Polis (European network of cities and regions), UITP (International Association of Public Transport), COPPE (Transport Engineering Programme) at Federal University of Rio de Janeiro, the Centre for Transport and Society (CTS) at UWE (University of West of England, Bristol), the Transport Research Laboratory (TRL), the municipality of Handan located in the Hebei province in China, Q-Sphere, SICE (Sociedad Ibérica de Construcciones Eléctricas) and Systematica.

Charging station

Analysis of user perception of different models of charching station for electric cars

Project Information:
Budget / Funding:
Duration: 06/2010 - 07/2010
Funded by: private project

Coordinator:
José Solaz
Instituto de Biomecánica de Valencia
e-mail: jose.solaz@ibv.upv.es

Motivation and objectives

The project objectives were:

- To know the functional and aesthetic requirements that final user ask for to an electric car and an electric supplier device.
- To analyze the perception of users - potential buyers of electric cars - of the charging station designed by the participant companies.
- To know the strengths and areas for improvement compared to other charging stations in the market.
- To analyze the ecological perception: knowing how to transmitting the ecological image of the product. Determine the effect in this image of different finishing, including the use of ecological materials (i.e compostites based in natural fibers).

Technical approach

The used techniques were:

- Discussion groups.
- Repertory Grid Technique (RGT).

The participants were potential users (hybrid car users or potential buyers interested in electric car), 45% women, 55% men, and aged between 22 and 59. Pictures of several charging stations (the users can compare the number of outlets, the display –touch screen or buttons– so on).

Status / Achievements

The participants have obtained very useful information about the user requirements for the electric car (desirable charge time and autonomy, about types of batteries and charging, information), and for charging stations features (size, information given –cost, waiting time, autonomy achieved...–, payment mode, placement, information about where they are and if they are free, kind of interface and interaction, safety...).
The project also gave information about the comparison between diferent designs of electric supplier devices, specially focused to achieved the easiest use and the most ecological perception.

Partners

CPD Carpats Design, S.L., Piel, S.A. and IBV.

Citymobil 2

Cities demonstrating automated road passenger transport

Project Information:
Duration: 4 years
Funded by: FP7
Webpage: www.citymobil2.eu

Coordinator:
Jesús Murgoitio
TECNALIA
e-mail: jesus.murgoitio@tecnalia.com

Motivation and objectives

CityMobil2 is setting up a pilot platform for automated road transport systems, which will be implemented in several urban environments across Europe. Automated transport systems are made up of vehicles operating without a driver in collective mode. They are deemed to play a useful role in the transport mix as they can supply a good transport service (individual or collective) in areas of low or dispersed demand complementing the main public transport network. A dozen local authorities or equivalent sites are in the bidding to be one of the five sites to host a 6-month demonstration. All recognize the potential of vehicle automation as part of their public transport network. Two sets of six vehicles each for the demonstrations will be supplied by two of the five manufacturers within the project. The project will procure the vehicles and make them available to the selected pilot sites for the duration of the demonstrations. In addition to the pilot activities, research will be undertaken into the technical, finantial, cultural, and behavioral aspects and effects on land use policies and how new systems can fit into existing infrastructure in different cities. The legal issues surrounding automated transport will also be addressed leading to a proposed framework for certifying automated transport systems.
CityMobil2 started in September 2012 and will run for 4 years and has 45 partners drawn from system suppliers, city authorities (and local partners), the research community and networking organizations.

Technical approach

Automated systems are ideally suited to supplement the existing mass public transport system with collective, semi-collective and personal on-demand and shuttle services. When demand is low or pick-up points are far apart, they are much more effective than conventional public mass transport systems. Cybercars are operated automatically with state-of-the-art obstacle-avoidance technology in order to run on existing infrastructure among pedestrians, cyclists and road vehicles in low-density areas. There are several automated transport schemes in operation around the world, including Group Rapid Transit at Rivium Park Shuttle (Netherlands) and Morgantown (USA) and Personal Rapid Transit at Heathrow airport (UK) and in Masdar (UAE). Some of these schemes have been operating for many years and have proven themselves to work efficiently and safely. However, they are difficult to integrate in urban areas because they need a completely dedicated and segregated infrastructure. A wider take-up of automated transport systems within cites or city-like environments has yet to happen. Nonetheless, studies have shown new transport systems based on automation to have significant potential in areas of low to medium public transport demand and/or as a feeder service to the main public transport network. Their costs are comparable to conventional public transport yet they can offer a high-frequency, on demand 'taxi-like' service.

Status / Achievements

On going project.

Partners

45 partners (among them TECNALIA).

CO_2Free
Cooperating 2 Foster Renewables and Energy Efficiency

Project Information:
Budget / Funding: 1.645.549 €
Duration: 24 months
Funded by: INTERREG IV C - Capitalization
Webpage: www.co2free-project.eu

Coordinator:
Avila County Energy Agency –APEA- (ES)
e-mail: rrodriguez@diputacionavila.es

Motivation and objectives

The CO_2Free - funded by EU-programme, Interreg IVC has a main goal the exploiting all available renewable energy resources and energy efficiency as fostering the electric mobility among others measures. Therefore reducing the fossil fuels use and working towards sustainable development with a low CO_2 economy.

Technical approach

According with the Regional Strategy for Electric Vehicle foreseen for Castilla y Leon Region, the electric mobility has a main role in the coming years as a competitiveness tool, so, right now is extremely important the following stages:

- Analyze, locate and manage the infrastructures needed for recharging vehicles, for this reason the public recharging stations net should be spread according with the regional standards among Avila province as well as within the other provinces.
- Enhance the knowledge, organizing some kind of practical test on electric vehicles or specialized seminar, in order to show up their pros & cons for persuading the target groups.
- Raising awareness campaign on electric mobility towards general public to be carried out by Avila County Energy Agency as a public stakeholder, communication towards private and public fleet owners, as well as citizens.

Status / Achievements

Study visit jointly with the partner Institute for Technology und Alternative Mobility belonging to Carinthia Region Government (Austria) to know their experience and exchange knowledge. Then APEA, as partner on CO_2Free project, will produced an Action Plan draft with further details on how implement pilot actions in the geographical area of Avila province in order to foster the electric mobility according and within the framework of the Regional Strategy for Electric Vehicle and collaborating with quite similar projects within the region focused on the issue.

Partners

- ERNACT European Regions Network for the Application of Communications Technology (IE).
- Agency for Regional Development and Innovations (BG).
- Avila Energy Agency – Avila County Council (ES).
- Derry City Council (UK).
- Donegal County Council (IE).
- Fomento de San Sebastián (ES).
- Office of Regional Government of Carinthia (AT).
- Regional Development Agency West Region (RO).
- Regional Council of North Karelia (FI).
- Association of Local Authorities Västernorrland County (SE).

CO^3
Collaboration Concepts for Co-modality

Project Information:
Budget / Funding: 2.293.288 €/ 2.000.000 €
Duration: Sept 2011/August 2014
Funded by: European Commission, FP7

Coordinator:
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Máximo Martínez
ITENE
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Motivation and objectives

Collaboration Concepts for Co-modality, CO^3, aims to increase the capacity utilization of European freight transport systems. In Europe current statistics show that vehicles are filled on average to only 57% of their weight capacity, and 27% of vehicles are running empty. CO^3 is a business strategy enabling companies throughout the supply chain to set up and maintain initiatives to manage and optimise their logistics and transport operations by increasing load factors, reducing empty movements and stimulate co-modality, through Horizontal Collaboration between industry partners, thereby reducing transport externalities such as greenhouse gas emissions and costs. The CO^3 consortium, which is made up of logistics specialists, manufacturing industry and transport service providers, has been working on the topic of collaboration and co-modality for two years and already produced a first draft of a model framework with legal and operational guidelines for collaborative projects in the supply chain.

Technical approach

The 18 partners of the consortium in seven EU countries will coordinate studies and expert group exchanges over a period of three years, and build on existing methodologies to develop European legal and operational frameworks for freight flow bundling, (WP2) -. We will come up with joint business models for inter- and intra-supply chain collaboration (WP3) to deliver more efficient transport processes, increase load factors and the use of co-modal transport. The results of the studies and expert group exchanges will be applied and validated in the market via case studies (WP4). The aim is to set up at least four different real-life applications of collaboration across the supply chain by using road transport, multimodal transport, regional retail distribution and collaboration for warehousing activities. We will also promote and facilitate matchmaking and knowledge-sharing through CO^3 conferences and practical workshops to transfer knowledge and increase the market acceptance of the CO^3 results. This will be done through discussions with a High Level Board of European Industry supply chain Leaders, (WP5).

Partners

LINDHOLMEN SCIENCE PARK AKTIEBOLAG, INSTITUTO TECNOLÓGICO DEL EMBALAJE, TRANSPORTE Y LOGÍSTICA, ARGUSI BV, KNEPPELHOUT & KORTHALS NV, PROCTER AND GAMBLE INTERNATIONAL OPERATIONS, S.A., PROCTER & GAMBLE EUROCOR N.V., PROCTER & GAMBLE ITALIA SPA, PASTU CONSULT SPRL, ASSOCIATION POUR LA RECHERCHE ET LE DEVELOPPEMENT DES METHODES ET PROCESSUS INDUSTRIELS – ARMINES, NEDERLAND DISTRIBUTIELAND VERENIGING – COORDINATOR, ELUPEG LIMITED, ECOLE NATIONALE SUPERIEURE DES MINES DE PARIS, TRI-VIZOR NV, GIVENTIS INTERNATIONAL BV, CRANFIELD UNIVERSITY, D'APPOLONIA SPA, FUNDACIÓN ZARAGOZA LOGISTICS CENTER, HERIOT-WATT UNIVERSITY, STICHTING DUTCH INSTITUTE FOR ADVANCED LOGISTICS, TECHNISCHE UNIVERSITEIT EINDHOVEN.

Cosmo

Cooperative systems for sustainable mobility and Energy Efficiency

Project Information:
Budget / Funding: 3.8 M€ budget
Duration: Nov. 2010 - Jun 2013
Funded by: CIP - ICT-PSP
Webpage: www.cosmo-project.eu

Coordinator:
Txomin Rodriguez
TECNALIA
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Motivation and objectives

The ITS applications implemented and tested in COSMO have the ability to reduce vehicle emissions by improving the information flow through cooperative-based communication technologies, by introducing energy-efficient components in the value chain, by influencing modal choice and promoting the use of public transport. Advance traffic management systems can smooth traffic flows and reduce stop & go conditions (which lead to high fuel consumption). At the scale of single vehicles, eco-driving can have a similar effect.
As such, COSMO addresses the main topics mentioned in a number of Communications, Actions Plans and Policies formulated by the EU. It is aligned and provides synergies with the most relevant ones.

Technical approach

Cooperative mobility services or ICT (Information & Communication Technology) applications that involve vehicle-to-vehicle and vehicle-to-infrastructure communications, have the potential to make road transport safer, more efficient and less damaging to the environment.
The recently developed prototypes (e.g. in EU research projects CVIS, SAFESPOT and COOPERS) have not however been subjected to extended trials or implemented in a real-life road environment, which means that the information regarding their practical deployment is still limited. This is also true for their actual impact on energy efficiency, for which estimates only are available, generally based on data from laboratory tests or small scale demonstrations.
COSMO aims to install and run practical demonstrations of a range of these new services in realistic conditions, in order to produce quantified results of the impact of given cooperative systems on the environment with regards to fuel consumption and CO_2 emissions detailed specifications covering technical, legal and organizational issues involved in deployment of those systems, including indications on their procurement, installation, operation and maintenance
Business Plans for the various systems are another crucial output of the project. These will be linked to a further important legacy, which is the set of pilot sites that will remain operational after COSMO has closed.
The results from COSMO will help raise awareness of the potential of cooperative systems in contributing to energy efficiency and pave the way for their large scale upt.

Status / Achievements

Finished project.

Partners

Mizar, Swarco, Asfinag, CRF, ERTICO, GEO Solutions, Kapsch, Lindholmen Science Park, Svevia, TECNALIA, Univ. Salerno, Volvo, ITS Italia.

COVE

Intelligent transportation system for cooperative guidance of electrical vehicles in special scenarios

Project Information:
Budget / Funding: 139.000 €
Duration: 12/2005 - 03/2009
Funded by: Spanish Ministry of Science and Education

Coordinator:
Felipe Espinosa
University of Alcala
e-mail: espinosa@depeca.uah.es

Motivation and objectives

There are transport scenarios where the pedestrian movement (with or without small luggage) is very intensive and the traffic of conventional vehicles is inadvisable or prohibitive: old cities with cultural tourist interest (Unesco World Heritage Cities), university campuses with many faculties/schools, great thematic parks, business parks, etc. Even it is applicable in industrial scenarios where coexist multi autonomously guided vehicles with transportation functions (products, materials and/or people), minimizing traffic jams and allowing flexible solutions.
In these transport scenarios, it would be very useful to have an intelligent transport system formed by a set of independent electrical vehicles that can move in convoy, in order to reduce safety and congestion problems and to optimize the transport resources.

Technical approach

This Project deals with the design and implementation of an electronic system offering control and communication solutions for the cooperation of transport units: platoon formed by electrical vehicle prototypes. Two are the key challenges: the integration of sensorial, communication and control systems; and the development of algorithms to ensure string stability and split/merge manoeuvres.
The global objective can be subdivided into the following tasks: Development of control solutions so that the convoy can track non-linear trajectories. Design of routing algorithms which take charge of merge-split manoeuvres of units. Proposal of sensorial and communication specific solutions the convoy units. Implementation of the electronics architecture on robotic units used as demonstrator of the cooperative guidance.

Status / Achievements

Some demonstrators of the COVE research project are available at:

- http://www.geintra-uah.org/idi/demostraciones/demostraciones

Several Book Chapters, Conferences presentations and Journal papers have been published concerning this research project, they are referenced at:

- http://www.geintra-uah.org/en/publications

Partners

Universidad de Alcalá. Departamento de Electrónica.
Universidad de Santiago de Compostela. Departamento de Electrónica y Computación. Universidad Carlos III. Departamento de Teoría de la Señal y Comunicaciones.

CRAVE

NOVARE CRAVE

Project Information:
Budget / Funding: 500k €
Duration: 2010 - 2012
Funded by: ENDESA NOVARE

Coordinator:
ENDESA SA
Santiago Cascante
e-mail: santiago.cascante@endesa.es

Motivation and objectives

In order to allow fast recharging processes, ancillary technologies such as energy storage systems and integration of RES, must be developed to avoid peak loading in the electric grid infrastructure.
The CRAVE project objective is the development of three different prototypes of quick charge stations:

- RRB: basic quick charge station.
- RRD: decoupled quick charge station (storage system integrated).
- RRI: RES integrated quick charge station.

Technical approach

The project will research on fast charge system features and smart grid interface capability to prevent peak loading on the electrical utility. This include the design and integration of an energy storage into fast charge stations that could allow renewable energy sources to store off peak power generation in battery banks for later use, allow the EV charging station to use a smaller electrical service and help prevent peak loading on the utility grid, and finally, allow additional utilization as a stored energy resource to the utility grid for possible use during peak demand periods.

Status / Achievements

RRB Prototype finished.
First data set of Quick charger performance obtained from equipment testing in laboratory and pilot installations.
Equipment testing and demonstration in Endesa Madrid and Barcelona with Nissan Leaf.

Partners

ENDESA, CIRCE.

Cuadrinwheel

Minicorner con motor en rueda para vehículo cuadriciclo eléctrico urban

Project Information:
Budget / Funding: n/d
Duration: 2011-2013
Funded by: Innpacto - MICINN
Webpage: n/a

Coordinator:
José Barbeta
INFRANOR

Motivation and objectives

The development proposed in this project is the work done by INFRANOR on axial flow electric drives.
Within this project CUADRINWHEEL the actions taken by both entities have been aimed at investigating fundamental and applied nature aimed at the improvement and innovation of electrical machines synchronous axial flux permanent magnet currently available to that company.
The actions carried out within the project CUADRINWHEEL listed below:

- Research and analysis of the thermal behavior of synchronous permanent magnet axial flow. We have performed a thorough study of the thermal behavior of synchronous axial flow. To support this study and in order to know the thermal behavior of current products Infranor and experimental modeling of the thermal behavior of this type of electrical machine. Note in this regard the construction and preparation by INFRANOR a new test specifically for the collection of experimental data required for subsequent thermal modeling of the electrical machine.
- Preliminary design and manufacture of prototype level 0 for performance evaluation of axial flux electric machine with new housing with air cooling capacity, according to project requirements. INFRANOR has worked on the design of a new housing with cooling capacity and has studied different topologies to cool the heads of stator coils. Furthermore, Infranor studied different types of solutions and resin impregnation to evacuate heat quickly in drivers.

Technical approach

Development of new electric power motors.

Status / Achievements

Finished project.

Partners

INFRANOR, TECNALIA.

DER
DER-IREC 22@ MICROGRID

Project Information:
Duration: June/2009 -November/2011
Funded by: Project co-funded by the European Regional Development Fund (ERDF) in the framework of the Operational Programme 2007-2013 for the Autonomous Community of Catalonia

Coordinator:
Marta Tolós
GTD Sistemas de Información, S.A
e-mail: marta.tolos@gtd.es

Motivation and objectives

DER IREC 22@ MICROGRID is an industrial research project focused on the creation of new products and services in the domain of Distributed Energy Resources (DER) and the Electrical Vehicle (EV).
The experimental research environment is an electric microgrid located at Catalonia Institute for Energy Research (Institut de Recerca en Energia de Catalunya - IREC).

Technical approach

To create a DER – IREC 22@ MICROGRID platform for experimentation, that provides experimental data to the different agents of the sector. To identify and overcome the technical and regulatory barriers that impedes adoption of the new paradigm of distributed energy resources represented by microgrids. To consider and foresee the impact the electric vehicle will have on the new energy model and on the microgrids. To analyse new energy management models that take into account the interaction between microgrids and distribution lines.

Status / Achievements

The microgrid is already operational and is currently being monitored. The optimization algorithms for intelligent management of the microgrid are being tested under the electric and economic scenarios provided by the utility.

Partners

GTD Sistemas de Información S.A; CIRCUTOR; Endesa Distribución Eléctrica S.L; CINERGIA.
Research centres: CITCEA-UPC; IREC; BDigital.

DHEMOS

Design of Tools for the integral Management of the mobility

Project Information:
Budget / Funding: 0.7 M€
Duration: Enero/2010 - Diciembre/2011
Funded by: Agencia de Desarrollo Económico de Castilla y León

Coordinator:
Javier Romo García
Fundación CIDAUT
e-mail: javrom@cidaut.es

Motivation and objectives

The main target of this Project is to Develop balanced and simultaneously all the agents involved in the sustainable mobility: Vehicle, Electric infrastructure and Communications infrastructure.
To reach this main target several secondary aims have been proposed, such are: To validate the Vehicle energy model, based on the measures made un a real electric Vehicle. To identify agents both in G2V or V2G paradigms, their objectives, functions and needs. To analyze and to determine the communication processes and network architecture needed to establish both a G2V and a V2G scenario and business model within the Smart Grid. To determinate the viability of the recharge of electric vehicles though renewable energies. To demonstrate the benefits of efficient and "intelligent" transport in urban and metropolitan areas. And to identify urban and metropolitan mobility patrons related to the future electro-mobility behaviour.

Technical approach

The main actor in the implementation of a sustainable mobility based in the electricity is the electric Vehicle. But in present conditions the limited range is its principal limitation. To overcome this limitation it is necessary to work in three lines at the same time: Optimized Vehicle to reduce the energy consumption. Information and communication for a smarter use of the energy. (both when the vehicle is in use or connected to charging/discharging system). And warranted electric supply.

Status / Achievements

The main objectives reached in the actual state of the Project are:

- The technical demonstrator of electric car has been instrumented to measure all the parameters involved in the energy consumption.
- A mathematical model for the determination of the consumption, and the equivalent emissions has been developed for different kinds of vehicles: EV, HEV and ICE.
- An initial version o f the program for optimizing routes is available.
- Several Studies of urban and periurban mobility have been developed.
- An energetic model for the evaluation of the integration of the electric Vehicle in the Smart Grid is available and it is now under evaluation.
- A complete state of the art study on V2G R&D status and related projects has been accomplished.
- Smart Grid's network architecture for G2V and V2G scenarios is under definition status.
- Different technology related to the charge points, communication equipments for the vehicles and communication has been designed, developed and tested.

Partners

Coordinator: Fundación CIDAUT (Spain). Centro para el Desarrollo de las Comunicaciones de Castilla y León (Cedetel) and Instituto Tecnológico de Castilla y León (ITCL).

DOMOCELL

Home systems for battery charging for electric vehicles

Project Information:
Budget / Funding: 4,546,916.87 €/ 3,477,789.46 €
Duration: 04/09 - 12/11
Funded by: Ministerio de Industria, Turismo y comercio (Gobierno de España) – Plan Avanza I+D
Webpage: http://domocell.amplia.es/

Coordinator:
María Alonso Peña
Amplia
e-mail: maria.alonso@amplia.es

Motivation and objectives

The project's objective is to develop DOMOCELL, an integral platform to recharge electric vehicles, allowing easily installations in car parkings communities, and encourage users to change the petrol-run vehicles by an electric vehicles thanks to a through a simple to use charging system. Besides, it detects fraud attempts and controls them via power outages, and generates alerts via alarms. Lets have an advanced communications infrastructure to support telemetry services / remote management through wireless technologies: GPRS / UMTS, ZigBee, PLC and mobility solutions (M2M). The system can improve network efficiency, since it includes a load planning module, taking care of management demand depending on economic and physical constraints received by the power companies.

Technical approach

DOMOCELL deploys the following elements of the architecture network:

- Electrical installation from any available point of light, with individual recharge points, or Meter Nodes, consisting of Outlet, RF-ID card reader (compatible with the MOVELE project), Consumed energy meter, Registry Data, Connection ID.
- A single mesh network for all the parking lot, so that all the charge points are connected.
- Loading mechanism in vehicles, based on Network Coupling and Identification System.
- Checkpoint or single concentrator node, at each facility to transmit information of all the counters to the power company with the characteristics: Connected to the network community, discriminates the community consumption from the individual consumption, Fraud prevention with a service disconnection mechanism and alarms.
- Telemetry and remote management system for the electricity company.

Status / Achievements

The functional development of the project focuses on implementing a system for recharging electric vehicles, providing an electric outlet in the community parking lots, providing energy only to the vehicle carrying out the charge. The achievements and innovative aspects are:

- Combined use of GPRS and ZigBee wireless networks, to allow reach deep areas in parkings.
- Use of identification technologies in vehicles and loading points.
- Management platform that integrates information from the production processes of the electric company, providing intelligence to the network of recharge components.
- Scalable design to add large number of new counters.
- Implements mechanisms advanced data encryption.

Partners

Citean, Nlaza, Gas Natural Fenosa (GNF), Red Eléctrica España (REE), Universidad Carlos III Madrid (UC3M-TELEM and UC3M-IELE), Universidad Politécnica de Valencia (IIE-UPV), Amplia.

eBIKE

R&D for the creation of a holistic service for electric bikes in Catalonia

Project Information:
Budget / Funding: 1.599.541 €/639.816,4 €
Duration: 10/2008 - 06/2011
Funded by: ACC1Ó - Nucli col·laboratiu (FEDER)

Coordinator:
Mª Rosa García, Manager, Project Management
Applus+IDIADA
e-mail: mrgarcia@idiada.com

Motivation and objectives

Perform an investigation and development on a 2 wheel vehicle concept that is environmentally friendly and which improves current accessibility systems and transport mobility options in our cities.

Technical approach

In this manner the project aims to promote the driving innovation of the Catalan motorcycle industry and to obtain a complete service with respect to this vehicle concept.

Status / Achievements

- A complete benchmarking process for this state-of-art electric vehicle concept.
- A complete virtual model of the motorcycle concept.
- Validation of the demonstrator and a complete development process for this type of vehicle.

Partners

IDIADA, SHAD, CREUAT, JJUAN, GUILERA, MAVILOR.

EBORN³

Development of an advance design, body and chassis for the next generation of electric vehicle (born as an "electric vehicle")

Project Information:
Budget / Funding: 671.265 €
Duration: 6/2010 - 12/2011
Funded by: Internal project
Webpage: No specific project website

Coordinator:
Michael J. Francis
Project Manager, Design Engineering
e-mail: mjfrancis@idiada.com

Motivation and objectives

Virtual design and partial development of an electrically driven urban vehicle.
The design specifications established by IDIADA called for the use of in-wheel motors and a flat battery pack mounted beneath the cabin floor between the axles. This liberated internal vehicle volume normally used for the internal combustion engine and gearbox for other uses. The mounting of the battery pack from below the vehicle suits production assembly processes and also results in an optimal weight distribution. The seating and load area packaging suits both the people and load transporter configurations. The adopted closures configuration underlines the practical approach to accessing the interior of the vehicle permitting the loading of a Euro-pallet in the cargo version. The vehicle is designed to provide the passengers with a sense of free space and ease of access, providing excellent load area volume in the cargo version. The configuration also lends itself to a half and half version, for example with two rear seats and a load area for two bicycles.

Technical approach

IDIADA has opted to concentrate on the more efficient use of internal space with a fresh approach to exterior styling combined with an innovative use of different closure concepts.

Status / Achievements

The exterior and interior styling concepts with surfaces have been created. Styling and technical feasibility is complete. The basic closure structures have been created as have the basic vehicle body structure. A 1:4 scale styling model has been manufactured. Work continues in the design and planning of a drivable Design Evaluation Vehicle.

Partners

IDIADA.

E-cabstar

Electric Light Truck

Project Information:
Budget / Funding: 1,654,42.41 € / 545,554.14 €
Duration: 06/2009 - 06/2011
Funded by: ACC1Ó – Nucli Individual (FEDER

Coordinator:
Salvador Ruiz, Product Manager, Commercial Vehicle
Applus+IDIADA
e-mail: sruiz@idiada.com

Motivation and objectives

The automotive industry, and especially the commercial vehicle industry, is pressured to put electric vehicles into the market. However, it is important to keep the same functionality as conventional ones. These citizen service vehicles are a tool for the right development of the cities, so new electric vehicle versions should meet all the working requirements. However, among today's drawbacks it is assumed that the electric vehicle technology is in the first development steps, and energy supply systems for electric vehicles are not fully operative in the cities. Therefore, IDIADA has developed a full electric truck to meet immediate electric vehicle needs. One of the project premises was to maximize the number of carry over parts. The vehicle designed was targeted to meet payload, thermal comfort, safety and vehicle range.

Technical approach

(1) Vehicle architecture: To get the optimal electric vehicle architecture it has been necessary to study different battery package configurations and electrical driveline and, paying special attention to the battery packaging in order to minimize the effect of its weight and volume. (2) Electric Driveline: The motor selection was made based on: one single reduction gear, maximum speed, hill climbing capacity, power density and motor efficiency. (3) Energy Storage: The final battery type selected is the Lithium Iron Phosphate (LiFePO4) as the most appropriate battery based on the energy density, price and safety. The battery system is made up of two symmetric modules mounted on the external side of the frame. The battery anchorage system is designed for quick assembly and disassembly when battery replacement is needed. (4) Others: Regenerative Braking System (RBS),Thermal comfort: A/C: (new high voltage motor-compressor) and Heating system.

Status / Achievements

IDIADA has developed this full electric truck based on an existing platform. This selected platform is the European version of the NISSAN Cabstar with the following achievements:

- **Weigth: Empty:** 2.350 Kg; Payload: 1.150 Kg; GVW: 3.500 Kg
- **Motor:** Type: Brushless PM motor/generator
- **Max Power:** 145 kW; Max Torque: 400 Nm
- **Battery:** Type: Lithium Iron Posphate; Capacity: 46 kWh; Charging time: 4 hours (empty to 100%)
- **Performances:** Range: 130 Km NEDC R101 UNECE; Max speed: 80 km/h; Hill climbing: more than 20% at GVW

Partners

IDIADA.

EcoGem

Cooperative Advanced Driver Assistance System for Green Cars

Project Information:
Budget / Funding: 3,157,978 €
Duration: September 2010 - February 2013
Funded by: European Commission-Research project (STREP)
Webpage: www.ecogem.eu

Coordinator:
Burak Onur
TEMSA GLOBAL
e-mail: burak.onur@temsaglobal.com

Motivation and objectives

EcoGem aims at providing efficient ICT-based solutions in this important field, by designing and developing a FEV-oriented highly-innovative Advanced Driver Assistance System (ADAS), equipped with suitable monitoring, learning, reasoning and management capabilities that will help increase the FEV's autonomy (distance that can be travelled before battery depletion) and overall electrical energy efficiency. The project will be based on the following objectives:

- To render the FEV capable of reaching the desired destination(s) through the most energy efficient route(s) possible.
- To render the FEV fully aware of the surrounding recharging points/stations while travelling.

Technical approach

EcoGem will innovate and implement a range of advanced technologies and solutions tailored for the FEV:

- Continuous monitoring of the vehicle's battery level and energy consumption.
- Autonomous optimised route planning.
- Cooperative optimised route planning.
- Continuous awareness of recharging points and optimised recharging strategy.
- Online management of recharging points.
- Holistic approach for energy efficiency and operational cost optimisation.

For the integration and testing, the project will use actual FEVs provided by PININFARINA and TEMSA.

Status / Achievements

- Study about the state of the art assessment and definition of use case scenarios.
- Requirements of the Ecogem platform.
- System Functional Architecture.

Partners

Temsa (Turkey) (coordinator),Pininfarina (Italy), PTV (Germany), HI-IBERIA (Spain), University of Bradford (UK), ITS (Poland), ICCS (Greece), Cosmote (Greece), Softeco (Italy), Navteq (Netherlands) & Tecnalia (Spain).

ECOLOGICAL CAR

Research materials and ecological processes in the automotive and transportation

Project Information:
Duration: 11/2008 - 12/2010
Funded by: Programa de Especial Relevància de la Conselleria d´Indústria, Comerç i Innovació
Webpage: http://automocion.ibv.org/index.php/es/proyecto/show_project/3/86

Coordinator:
José Solaz
Instituto de Biomecánica de Valencia
e-mail: jose.solaz@ibv.upv.es

Motivation and objectives

The existing need to overcome technical barriers for new applications, increasing environmental awareness and the increase in fuel prices, are raising new challenges in the design of automotive components and forcing these companies to develop works of R+D+i. It seeks to develop new construction solutions and new materials, in order to reduce vehicle weight and therefore CO_2 emissions. All this while maintaining the quality standards required by the sector and integrating user-perceived quality as a criterion of essential validation. In production: It is necessary to improve efficiency in resource use, reusing byproducts (waste from other processes) and setting the end of the cycle of matter (circular economy). It is also essential the elimination, mitigation and management of waste through recycling and new technologies through the use of new technologies and processes for reuse of material, including new waste recovery processes/products taking into account environmental, social and economic.

Technical approach

IBV used the following methodologies for the project development: user panels, repertory grid technics, context maping, quantitative study.

Status / Achievements

The main objective is to help SMEs in the automotive component sector to remain competitive by introducing new processes, new materials and new products that reduce costs and provide greater value to the manufactured components. The partial objectives of this project were:

- Industrial research in application of new plastic materials (renewable materials, recyclable materials, study of thermo transformation processes).
- Industrial research on new metallic materials (steel, titanium and magnesium alloys), high strength, as well as processing technology.
- Optimization of process from the point of view of energy efficiency.
- Research on the model of user-perceived quality of parts made from materials developed as a criterion of essential validation.

The last objective lies in the IBV. In particular, the automotive industry has high standards of quality to be maintained, and an end customer with very high expectations. The impression conveyed by developing products with new materials may be different from those to which the user is accustomed, and therefore, these innovations must be carefully studied before becoming a standard product, to avoid having problems in their implementation.

Partners

Met Tecno, 2000 S.L., Galol, S.A., TMD Friction España, S.L.U., Edinn Consulting España, S.L., Nutai, S.L., Aleaciones Estampadas, S.A., GTA Motor, S.L., Alberto Mora Galiana GALIANA, S.A., CPD, S.L.-Carpats Design, Piel, S.A., AIMPLAS, AIMME, IBV, ITE. It also has the support of REDITA and AVIA.

eCoMove

Project Title Cooperative Mobility Systems and Services for Energy Efficiency

Project Information:
Budget / Funding: 13,7 M€
Duration: May/2010 - Nov/2013
Funded by: FP7
Webpage: www.ecomove-project.eu

Coordinator:
Txomin Rodríguez
TECNALIA
e-mail: txomin.rodriguez@tecnalia.com

Motivation and objectives

The transport sector represents 23% of global CO_2 emissions, while road transport is responsible for around 75% of transport sector emissions and freight accounts for up to 30% to 40% of road sector emissions. This has grown by 45% between 1990 and 2007 and is expecting to keep on rising, despite cleaner engines. Information and communication technologies (ICT), such as the applications developed in eCoMove, specifically configured to target avoidable fuel consumption have the potential to achieve a cleaner and more energy-efficient mobility of goods and people. By applying the latest vehicle-to-infrastructure and vehicle-to-vehicle communication technologies, the project will create an integrated solution comprising eco-driving support and eco-traffic management to tackle the main sources of energy waste by passenger and goods vehicles.
The eCoMove project will target three main causes of avoidable energy use by road transport to bring fuel wastage to a minimum: inefficient route choice, inefficient driving performance and inefficient traffic management & control.
Tackling these inefficiencies means finding solutions to support the:

- Driver to apply the appropriate driving strategy in order to use the least possible fuel by finding the "greenest" route, the most economical use of vehicle functions, the best path through surrounding traffic and how to negotiate the next traffic signals with least chance of stopping.
- Fleet manager to adopt a self-learning "driver coaching system" based on incentives for energy efficiency gains, and a cooperative planning/routing system that selects the most economical route for deliveries.
- Traffic manager to optimize traffic lights phases and apply other traffic control measures so that the ensemble of vehicles in the network consumes the least possible energy, e.g. by granting priority to energy-greedy vehicles to avoid unnecessary stops.

Technical approach

eCoMove will develop core technologies and applications based on vehicle-to-vehicle and vehicle-to-infrastructure communication or so called "cooperative systems", where vehicle eco-relevant data can be shared real time with other vehicles and traffic controllers as a basis for fuel-efficient driving support and traffic management.

Status / Achievements

On going project.

Partners

Ertico, Asfa, AVL, BWM, Bosch, CGI, Continental, CRF, CTAG, DAF, DLR, Ford, GoGreen, Gemeente Helmond, IKA, Magneti Marelli, Mat.Traffic, Navteq, NEC, Peek, PTV, Q Free, RACC, TECNALIA, Technolution, TomTom, Telecom Italia, TNO, TUM, Vialis, Volvo.

ECOSHELL

Development of new light high-performance environmentally benign composites made of bio-materials and bio-resins for electric car application

Project Information:
Budget / Funding: 3,950,000 €
Duration: 01/2011 - 09/2013
Funded by: UE (7 FP)
Webpage: www.ecoshell.ue

Coordinator:
Alain de Larminat
CERGI
e-mail: alain.delarminat@citi-technologies.com

Motivation and objectives

The goal of ECOSHELL project was to develop new automotive materials that contain renewable materials in proportions as high as possible for lightweight structures with high mechanical properties, thermal stability and easy-to-use fabrication (high storage stability and no release of harmful volatiles).

Technical approach

The project ECOSHELL is focusing its development of new light high-performance environmentally benign composites for electric car application on bio-materials and bio-resins. In that way the project concept is fully in line with the European end of life vehicle directive stating that by 2015 vehicles must be constructed of 95% recyclable materials with 85% recoverable through reuse or mechanical recycling and 10% through energy recovery. The use of 'green' composites is expected to greatly increase and prevail in the future vehicle.

Status / Achievements

Started 1/01/2011.
First milestone 1/09/2011 (Materials selection).

The ECOSHELL consortium is made up of 10 European organisations (SMEs, universities, research centres and industrial companies). CNIM-CSIC is the Spanish partner (Dr. Rincón: mrincon@cenim.csic.es).

Ecufast

Development of Electronic Systems and tools for Transport

Project Information:
Budget / Funding: n/d
Duration: 2012-2013
Funded by: Diputación Foral de Bizkaia

Coordinator:
Dionisio del Pozo
TECNALIA
e-mail: Dionisio.delpozo@tecnalia.com

Motivation and objectives

The project aims to bring SW techniques and rapid prototyping tools control HW platforms microcontroller or DSP's most used in the development of ECU's application in the transport sector. The prototype will be let designers to get results near the compliance of the security levels ASIL recent CD of ISO 26262 implementation rules:

- Develop the capacity prototyping low level (ready to start actions of industrialization), approaching design and development methodologies HW, FW and SW for ECU.
- Provide an advisory service specializing in design and development of ECUs HW-SW.
- for the transport sector in general.
- Offer a solution HW / SW development and implementation of control applications within the domain powertrain.
- Training the team in design and development FW / SW and in the ISO26262 standard for development electronic.
- Create a methodology for prototyping low level of ECUs for the sector transportation.

Technical approach

Development of algorithms and control strategies for the development of an integrated HW-SW configurable product.

Status / Achievements

On going project. SW and HW prototypes in development.

Partners

TECNALIA, ELSON, AIC.

E-DASH

Electricity Demand and Supply Harmonizing for EVs

Project Information:
Budget / Funding: 8,533,674 €/5,300,000 €
Duration: (month/year-month/year)
Funded by: EU – FP7 – Green Cars
Webpage: www.e-dash.eu

Coordinator:
Gloria Pellishek
ERPC / Volkswagen
e-mail: g.pellischek@erpc-gmbh.com

Motivation and objectives

The sustainable integration of the electric vehicles requires an intelligent charging system for the real-time exchange of charge related data between FEVs and the grid in order to allow the management of:

- High-current fast-charging for large numbers of FEVs in a brand-independent way.
- Price-adaptive charging/reverse-charging at optimum price for the customer.
- The real-time grid balancing according to spatial and temporal needs and capacities, influenced by the demand.
- (FEVs) and the supply side (unpredictability of regenerative energies).
- Competent remote load charging process control in order to prevent damages of FEV batteries.

It is the objective of e-DASH to develop those IC Technologies and processes that are needed to achieve the real-time integration of "FEVs" in the European Electricity Grid to enable an optimum electricity price to the customer and at the same time allows an effective load balancing in the grid. Great emphasis is placed on the "openness of the V2OEM Interface" granting access to multiple players maintaining the customers' choice.

Technical approach

"e-DASH" aims at the harmonization of electricity demand in Smart Grids for sustainable integration of electric vehicles. This is addressed by an intelligent charging system supported with near real-time exchange of charge related data between EVs and the grid. Adopting the e-DASH approach allows high-current fast-charging for large numbers of EVs in a brand-independent way and price-adaptive charging/reverse-charging at optimum price for the customer leading to increased demand of EVs. In order to prevent damages of costly EV batteries, sophisticated charge control is inevitable.

Status / Achievements

e-DASH project main objectives of the 24 months period were to specify the software components, services, interfaces, architecture and first prototypes implementation concepts covering the V2G Front End, the V2G Brokering and the V2G Capability. These objectives have been met after 2 years of execution of the project.

Partners

Volkswagen; Renault; Centro Ricerche Fiat; RWE; Endesa Ingenieria; Commissariat a l'energie atomique et aux energies alternatives; Erpc; ATOS SPAIN; Trialog; Technische University of Dortumund; Knowledge Inside; Eurisco; Institut fur angewanndte systemtechnik; Broadbit Slovakia.

EE-VERT

Energy Efficient Vehicles for Road Transport

Project Information:
Budget / Funding: 6.47 M€ / 3.62 M€
Duration: 01/2009 - 12/2011
Funded by: FP7 / Small or medium-scale focused research project
Webpage: http://www.ee-vert.net/

Coordinator:
Antoni Ferre
LEAR CORPORATION
e-mail: AFerre@lear.com

Motivation and objectives

Despite improvements in individual areas of the modern vehicle such as the powertrain, a considerable amount of energy is wasted due to the lack of an overall on-board energy management strategy. Further electrification of auxiliary systems (the "more electric vehicle") promises energy and efficiency gains, but there is a need for a co-ordinated and predictive approach to the generation, distribution and use of energy.
EE-VERT will develop strategies in conventional vehicles, also applicable to hybrids, for overall energy management (thermal and electrical) to reduce fuel consumption and CO_2 emissions. EE-VERT will tap into new sources such as recuperation of braking energy and solar cells. Also, the need for the strategies to guarantee power supply to safety-related systems will be considered. It is estimated that EE-VERT technologies can reduce CO_2 emissions by around 10% for a car following the NEDC (New European Driving Cycle).

Technical approach

Development of an EE-VERT reference architecture based on the following approach:

- Decouple generation. In this way, generation could be done in a more efficient manner (at higher voltage) while the same degree of functionality and availability of the 14V standard power net is assured by a DC/DC converter.
- Introduce energy harvesting for new energy sources (braking / thermal / solar).
- Improve vehicle storage capability in order to profit increased energy recovery and energy harvesting.
- Improve electrification of auxiliary systems with optimized operation.

Status / Achievements

- EE-VERT reference architecture issued.
- Complete simulator for EE-VERT reference architecture issued.
- Development of a new generator with recuperation capabilities up to 12kW.
- Development of a new 40V Li-ion battery with high current recharge capability .
- Development of a 1.2kW multiple-input DC/DC converter able to work with 12V and 40V batteries as input / output and several energy sources simultaneously.
- Development of new electric VTG actuator.
- Integration of EE-VERT new components and new reference architecture in a demo car (ongoing).

Partners

Mira Ltd (UK) - Coordinator, FH Joanneum Gesellschaft (Austria), Engineering Center Steyr (Austria), Lear Corporation (Spain), Volvo Technology (Sweden), Beespeed Automatizari (Romania), Robert Bosch (Germany), Centro Ricerche FIAT (Italy), Universitatea Politehnica Din Timisoara (Romania).

EFRUD
Emissions Free Refrigerated Urban Distribution

Project Information:
Budget / Funding: 1.463.860 € / 728.880 €
Duration: October/2010 - October/2013
Funded by: Life + 2009
Webpage: http://www.efrud.info/

Coordinator:
Ing Sebastiano Vinella
CONSORZIO TRAIN
e-mail: trainroma@consorziotrain.it

Motivation and objectives

The project is aimed at reducing the environmental impact due to the transport of perishable goods that need to be refrigerated (e.g. farm produce, milk and dairy products, meat, medicines and medical stuff, etc...) during the distribution operations within urban areas. Other objectives:

- Minimize the environmental impact of transport (emissions and noise).
- Improving the energy efficiency process in the logistic chain, ensuring the preservation of the quality of perishable goods, considering the service requirements, the direct costs and managing interactions with current business - objective of demonstrating feasibility on large scale application.

Technical approach

The project proposes the demonstration of an innovative transport solution based on a prototype that integrates the use of: passive-cooling refrigerators, electric vehicles, system for charging the self-cooling refrigerators, on-board diagnostic tools for monitoring the style of conducting the vehicle and controlling the quality of perishable goods.

Status / Achievements

- Demonstration of lower environmental impact (noise, CO_2, SO_2, PM_{10}, etc.) and energy efficiency.
- Design of an advanced modular approach applicable to a range of possible situations and different scale able to assess the feasibility and to evaluate the environmental benefits (and the economics) for different situations.
- Definition of a green public procurement of Cities participating to the demonstration.
- Support to the integrated urban policies for sustainable logistics of refrigerated goods to be encouraged by local authorities.
- Identification of the different interest groups and management of segmented communication in order to promote the contribution of the project results to the improvement of the urban environment.

Partners

CONSORZIO TRAIN
ITENE : Instituto Tecnológico del Embalaje, Transporte y Logística www.itene.com
COMUNE DI ROMA
Fondazione METES

E-Light

Advanced Structural Light-Weight Architectures for Electric Vehicles (FP7-266284)

Project Information:
Budget / Funding: 2,938 M€ / 2.1 M€
Duration: January/2011 - December/2013
Funded by: European Commission in FP7 (SST-GC- FP7-266284)
Webpage: www.elight-project.eu

Coordinator:
Esteban Cañibano Álvarez
Fundación CIDAUT
e-mail: estcan@cidaut.es

Motivation and objectives

The E-LIGHT project aims to explore the requirements that are to be fulfilled, investigate the materials suitable for application and to develop the optimal electric-vehicle architecture to enhance their performance. The following characteristics will be studied in the E-Light project in order to develop optimal EV architecture solutions: Modularity of components, Ergonomics of designs, Innovative safety concepts and Development of lightweight designs (decreasing the overall power consumption will increase the range).
The main objective of the E-Light project is to develop an innovative multi-material modular architecture specifically designed for electric vehicles, achieving optimal light weight and crashworthy performances whilst ensuring good ergonomics on board.

Technical approach

In order to achieve this objective, the following scientific and technical objectives have been defined:

- Identification of architectural requirements for future EV, focusing on lightweight architectures for different battery and electric motor configurations (front or rear stand alone, wheel in hub).
- Identification of optimal multi-materials solutions to become part of the developed EV architectures.
- Optimise geometries and designs for developing EV architectures, taking into account previously studied architectural requirements and materials.
- Define the design methodology and testing procedures in order to develop general design guidelines and testing procedures toward more sustainable, lightweight, modular concepts of the design process.

Status / Achievements

The project has started this year, currently the specifications and requirements have been identified, as well as a design matrix.
The materials and joining/assembly technologies are under research, as well as the metallic and reinforced composites most suitable for becoming the urban EV architecture materials.
The basic structure for the architecture design will be composed of a light material chassis with different passenger/cargo designs made in reinforced composites. By using this approach maximum modularity will be achieved.

Partners

Fundación CIDAUT (Spain), coordinator. Advanced Manufacturing Research Centre. Sheffield University, Ricardo UK ltd. (UK), TECNALIA (Spain), EAST-4D Carbon Technology GmbH (Germany) Pininfarina S.p.A. (Italy) and Pôle Véhicule du Futur (France).

ELVA
Advanced Electric Vehicle Architectures

Project Information:
Budget / Funding: 4,815,760 € / 2,889,398 €
Duration: 10/2010 - 05/2013
Funded by: European Commission (PPP Green Cars FP7)
Webpage: www.elva-project.eu

Coordinator:
Eduard Túnica
IDIADA
e-mail: etunica@idiada.com

Motivation and objectives

The ELVA project focuses on electric cars for city passengers and urban delivery where traffic volume is high and the impact on the local environment is most significant. ELVA is to deliver results that allow for full exploitation of a new freedom in architecture and design, while responding to changing future market demands.
ELVA will deliver best practices and evidence based design rules for modular lightweight and safe architectures specific to EVs. These practices and design rules will feed into and partially replace existing experience-based design methodologies, which have been developed over more than a century of vehicle design around the internal combustion engine.
ELVA will achieve a substantial impact with regard to a greener road transport system and a competitive car industry due to the strong involvement of leading industrial partners including 3 car makers that together are expected to produce a substantial part of all EVs sold in Europe in the next decade.

Technical approach

ELVA project will generate, investigate and analyze innovative design concepts for EVs. It will deliver a wide range of advanced modular architectures which enable at least the same high level of intrinsic safety as known from current best in class conventional vehicles at minimal weight, maximised energy efficiency, optimized ergonomics & loading space at affordable costs as well as acceptable levels of comfort and driving performance.
This will be achieved with the help of many different tools such as CAD analysis and CAE simulations in many fields analyzing the different vehicle performance functionalities.

Status / Achievements

The project has just began and is in its first Work Package dealing with market and technology forecast and specification of requirements.
A customer survey has been issued in order to identify better the requirements of customers and the societal scenario for electric vehicles.
Moreover, a design contest is expected. The ambition is to allow a maximum of open interpretation of user preferences.

Partners

IKA (Coordinator), IDIADA, Continental, VW, Chalmers, CRF, Renault.

ELVIRE

Electric Vehicle Communication to Infrastructure, Road Services and Electricity Supply

Project Information:
Budget / Funding: 10 M€ / 5 M€
Duration: April/2010 - April 2013
Funded by: European Comission (FP7)
Webpage: www.elvire.eu

Coordinator:
Narcis Vidal Tejedor
ENDESA, S.A.
e-mail: narcis.vidal@endesa.es

Motivation and objectives

Elvire was approved by the EC under the 'ICT for Safety and Energy Efficiency in Mobility' Work Program Topic. The project's purpose was to develop an effective system, which is able to neutralize the driver's "range anxiety" and encourage the customers to embark the fully electric road transport:

- An on-board electricity-status IC-unit (E-ICT), combined with its enhanced in-vehicle service layer.
- A customer oriented, open external service platform required for the optimum interaction between the user/vehicle, the data processing & service provision layer and an intelligent electricity infrastructure.
- An investigation of the most relevant scenarios and business cases.

The main partners of this consortium were: Endesa, Continental, Better Place, Renault, Volkswagen, SAP.
Main results of Elvire project were presented in Amsterdam on April 2013, and the public results are available on the project website: www.elvire.eu

Partners

ENDESA, S.A.; Continental ; Renault; Better Place; Volskwagen; CEA List; SAP; Motorola.
ERPC GmbH; Lindholmen Science Park; ATB; Erasmus University College.

EMERALD

Energy ManagEment and RechArging for efficient eLectric car Driving

Project Information:
Budget /Funding: 4,771,324 €/3,150,000 €
Duration: 36 Months, start 1/9/2013
Funded by: EC, FP7 Green Car Initiative
Webpage: On construction, soon available

Coordinator:
Dr. Marco Boero
Softeco Sismat SRL
e-mail: marco.boero@softeco.it

Motivation and objectives

Emerald focuses on energy use optimisation and on the seamless integration of the FEV into the transport and energy infrastructure, by delivering clear advances over the state-of-the-art. The goal is to assist the FEV in becoming a successful commercial product.

Technical approach

In order to achieve its ambitious objectives, EMERALD will innovate a range of novel ICT solutions, each one seamlessly integrated with the others, providing a multifaceted and comprehensive approach on these issues. EMERALD will introduce Integrated in-vehicle energy management, comprising:

- Dynamic energy-driven management of FEV auxiliaries, tightly integrated with consumption prediction functionality, enabling pre-emptive energy conservation measures.
- Energy-efficient long-range route planning and optimisation, enabling extension of FEV's driving range and automatic scheduling of recharging stops en route.
- Performance-centric machine learning for consumption prediction, introducing optimisation and cooperative training of machine learning functions targeted for energy consumption and traffic prediction based on experience.
- Driver profiling functionalities, through monitoring of acceleration/braking patterns, for the enhancement of route consumption prediction functionality.
- V2G traffic and consumption data synchronisation, as a new cooperative information-sharing scheme.
- User-centric charge and discharge management.

EMERALD will also introduce: Enhanced FEV-related power demand prediction and power flow management support, taking advantage of consumption patterns as shared in a cooperative manner by the FEVs themselves, as well as from FEVs' recharging bookings; Cooperative FEV fleet management, though holistic and dynamic, multi-parameter, fleet control optimisation, taking into account energy and recharging limitations; and FEV-specific driver.

Status / Achievements

The project held its Kick Off Meeting last September in the city of Genoa. Currently it is in the phase of the requirements elicitation and the definition of the different envisioned Use Cases and associated KPI. It will soon start the phase related to the Technical Arquitectural design.

Partners

Softeco (Project Coordinator, IT); Pininfarina (IT); Temsa Global (TR); Telvent Arce Sistemas (ES); Fundacion Tecnalia Research & Innovation (ES); HI-Iberia Ingenieria y Proyectos (ES); Instytut Trasportu Samochodowego (PL); Institute of Communication and Computer Systems (EL); Cosmote (EL); Comune di Lucca (IT); Lucense SCPA (IT); PPC (EL); Comarth Engineering (ES).

e.MOCIONATE

Sistema inteligente de optimización de la movilidad urbana

Project Information:
Budget / Funding: 1,540,900.03 €
Duration: 22 months
Funded by: Valencian Government by European Funds for the Regional Development
Webpage: http://e.mocionate.com

Coordinator:
Sixto Santonja & Jaime Sempere
Energy Technological Institute &
Computing Technological Institute
e-mail: sixto.santonja@ite.es
j.sempere@iti.upv.es

Motivation and objectives

The e.MOCIONATE Project is included within the scope of urban mobility focusing on users by promoting new ways of moving and knowing the city in an ecological and sustainable way.
The idea of this project is to research in a comprehensive platform of services to ensure that a sustainable urban electro-mobility by an energy-efficient way.

Technical approach

e.MOCIONATE Project expect to cover not only the aspects of sustainable mobility, but also the introduction of value-added services using an OpenSource applications and communications platform that allows to adapt to the needs of citizen groups identified in urban areas.
The result will be the convergence and interoperability between the different actors involved in the model of sustainable urban mobility raised by e.MOCIONATE Project, taking into account the comprehensive services platform for users, charging infrastructure and own electric vehicles.
In order to validate the concept, a test field is defined in the city of Valencia. It's focused on a user model, defined during the urban mobility study, and offering a compact solution of integrated value-added services with an customer-oriented applications.

Status / Achievements

After few months from the beginning of the project, architecture for the development has been defined.
Trough the different contacts with the Valencian government and the experience of the MOVUS company, it have began a mobility study in order to define user profiles and needs. Also, by using a poll, involving not only the internet user, but also, tourist, government workers, fleets, etc.
The functional requirements of the software platform are defined, taking into account the current energy infrastructure to integrate the electrical vehicle as a urban transport.
Finally the business model is been established in order to cover all the user profiles and allowing that the development could be validated in a field test in the city of Valencia.

Partners

MOVUS, S.L. - CPD, S.L. - NUTAI, S.L. - SCOLAB, S.L. - PRODEVELOP, S.L. - DISID, S.L.
The research centers: ITE (The spanish acronym of Energy Technological Institute) and ITI (The spanish acronym of Computing Technological Institute).

Eunice

Eco-design and Validation of In-Wheel Concept for Electric Vehicles

Project Information:
Duration: 2012-2015
Funded by: FP7
Webpage: www.Eunice-project.eu

Coordinator:
Dionisio del Pozo
TECNALIA
e-mail: dionisio.delpozo@tecnalia.com

Motivation and objectives

The design, development and validation of a complete in wheel motor assembly prototype (electric motor, power electronics, reduction gear, structural parts and wheel), based on a McPherson corner suspension topology, to meet the defined car top level specifications.

Objectives:

- Motor efficiency map improvement based on real representative driving cycle (mix of USA-FTP75 – USA Highway – NEDC, total 100 Km) not on peak efficiency.
- Air cooling, integration simplicity. Air cooling is a very challenging target, and offers market penetration competitive advantages.
- Power electronics integrated in the motor cover with cooling capabilities.
- Rotor. Polymeric composite with assembled magnets able to withstand high rotation velocity.
- Effective integration of gearbox oil circuit to remove heat generated in the motor stator.

Technical approach

The main objective of this project is the design, development and validation of a complete in wheel motor assembly prototype (electric motor, power electronics, reduction gear, structural parts and wheel), based on a McPherson corner suspension topology, to meet the defined car top level specifications. The main technical risks associated with the use of an in-wheel concept are the thermal stress under extreme operation conditions, vehicle dynamics, driveability, safety and durability. The proposed baseline concept will be based on an air cooled motor in wheel concept, with conventional airflow driven by vehicle, and forced airflow provided by an innovative wheel design. Detailed specifications of extreme operation conditions will be defined and validated by the OEM, during the project, including the hot day-cold day conditions, representative of vehicle extreme use. During the assembly and testing phase, the aspects related to vehicle dynamics, driveability, safety, user acceptance, reliability, previously defined, will be validated with the motor in wheel prototypes installed in a test vehicle. In addition, aspects as eco-desing, LCA of the concept and components, dismantling and recyclability of key materials and rare earths will be considered during the in-wheel concept design.

Status / Achievements

On going.

Partners

Tecnalia, Pininfarina, Magneti Marelli, CIE Automotive, DENN, IVL, Infineon, AIC, AIT, Hayes&Lemmerz, Clepa, GKN.

eVADER

Electric Vehicle Alert for Detection and Emergency Response

Project Information:
Budget / Funding: 2.7 M€ / 1.8 M€
Duration: 36 Month
Funded by: European Commission (PPP Green Cars FP7)
Webpage: To be defined

Coordinator:
Juan J. García
Applus+ IDIADA
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Motivation and objectives

Recent studies suggest that vehicles, driven in electric mode, either hybrid or pure electric vehicles, are considerably quiet and, thus, that they constitute a safety hazard for pedestrians and bicyclists in traffic. Actions have been taken by the US and Japanese governments as well as within international bodies such as UN/ECE and ISO, with the expected outcome that "minimum noise" of vehicles shall be measured with a standard method and legal limit values for such "minimum noise" shall be established. eVADER will investigate the interior and exterior sound escape of electric vehicle for safe operation, considering driver's feedback, feasible pedestrian reactions, driver and pedestrian warning systems and pedestrian safety. The project will also analyse innovative methods to improve the acoustic detectability of electric vehicles in urban scenarios. The project will define solutions to warn vulnerable users of a nearby moving vehicle while providing means for heightening the awareness of drivers in critical situations.

Technical approach

Among other's some of the most important areas covered by eVADER will be:

- Optimum warning signals definition to induce correct driver reaction for safe operation.
- Adaptation of the warning signals to the real in-service vibro-acoustic environment.
- Optimum warning signals definition for pedestrians in close-to-accident situations.
- Adaptation of the warning signals to real urban and exterior noise.
- Integration of the generation of acoustic warning signals with in-vehicle intelligent systems data such as external microphones, vehicle speed (CAN) or ADAS (Advance Driver Assistance) systems.
- Use of in-vehicle complementary information to improve directivity, timing, intensity, modulation and frequency characteristics of the warning signal, depending on real close-to accident scenario.
- Optimum warning signals maintaining the quietness of residents.

Status / Achievements

Under negotiation with the European Commission.

Partners

IDIADA, TUD, LMS, AIT, INSA-Lyon, NISSAN, RENAULT, PSA, CONTINENTAL, European Blind Union.

E-VECTOORC

Electric-VEhicle Control of individual wheel Torque for On- and Off-Road Conditions (E-VECTOORC)

Project Information:
Budget / Funding: 4.76 M€ / 3.09 M€
Duration: 09/2011-09/2014
Funded by: STREP – FP7 – 2011 ICT GC
Webpage: www.e-vectoorc.eu

Coordinator:
Dr. Aldo Sorniotti
University of Surrey
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Motivation and objectives

In recent years, significant improvements have been made in energy storage units and electric motors (EM) with high power and energy density and efficiency. Moreover, in relation to vehicle dynamics, electric vehicles (EV) have the potential to achieve hitherto impossible levels of handling characteristics because of the precise controllability of EMs. The aim of this project is to evaluate the potential benefits of individual motor control in terms of efficiency, safety, comfort and fun-to-drive in both on- and off-road driving conditions, in EVs with multiple Ems.

Technical approach

Potential benefits will be demonstrated by:

- The development and testing of yaw rate and sideslip angle control algorithms combining front/rear and left/right torque-vectoring to improve overall vehicle dynamic performance.
- The development and experimental testing of novel strategies for the modulation of the torque output of the individual electric motors to enhance brake energy recuperation, Anti-lock Brake function and Traction Control function. The benefits of these strategies include reductions in vehicle energy consumption, stopping distance, and acceleration times.

The developed algorithms will include failsafe strategies and controlled shutdown procedures. The overall control strategy will employ a modular control architecture to allow easy implementation of different vehicle layouts, vehicle sizes and vehicle applications. The activity is being carried out using vehicle dynamics simulations and Hardware-in-the-Loop (HiL) testing of vehicle components and subsystems, which is complemented by full-scale experimental testing of the entire system using a highly versatile vehicle demonstrator for drivetrain architectures.

Status / Achievements

During the first two years of the project, the consortium has achieved the following outcomes:

- Development of a common simulation platform, validated through specific road tests.
- Development of an off-line optimization procedure for the design of the target control yaw moment according to a reference set of vehicle understeer characteristics, an objective function and a set of equality and inequality constraints.
- Installation of the first iteration of the electro-hydraulic braking (EHB) system (Lucas Varity TRW) on the vehicle demonstrator, upgrading of its control software and testing on HiL rigs.
- Development of the switched reluctance electric powertrains of the vehicle demonstrator. They have been tested on the electric motor drive rig of their manufacturer (Inverto) and have been installed on the first iteration of the vehicle demonstrator.
- Development and experimental testing of the yaw moment controller and the active vibration controller of the electric drivetrains on the two-wheel-drive demonstrator.
- Development of ABS and TC system algorithms through vehicle dynamics simulations and assessment of their performance through HiL tests including the EHB system unit.

Partners

University of Surrey, TechnischeUniversitaet Ilmenau, Jaguar Cars , Land Rover, Flanders' Drive, Inverto, Fundación CIDAUT, Instituto Tecnológico de Aragón, Skoda Auto, Virtual Vehicle, TRW.

EVIC
Electric Vehicle Intelligent Charging

Project Information:
Budget / Funding: 800,000 € / 300,000 €
Duration: 09/2012-05/2014
Funded by: ACC10 (Nuclis) - FEDER

Coordinator:
Pere Mogas
FICOSA
e-mail: F80EVIC_ECO@ficosa.com

Motivation and objectives

EVIC aims at covering the control of the electric grid loading through intelligent energy demand management. To achieve that, EVIC will consider the knowledge of the geographical distribution of EVs in real time and their updated power needs. The focus of the project will be the development of a centralised demand management system and location "based added value" services for different operational scenarios that increase EV attractiveness and its user acceptance. Both objectives will be assisted by the release of EVs position and battery status information to EVAs and utilities.

Technical approach

The main following components have been identified in the EVIC system that are being developed:

- Electric Vehicle: On-board Unit (OBU): consisting on a platform integrating sensors for positioning (GNSS receiver + IMU), WiFi/WAVE wireless communications and interface with the battery. Connected to CAN bus for obtaining basic vehicle data.
- Terrestrial Communications Infrastructure: based on WiFi/WAVE Road-side Units.
- Energy Demand Management System, which: can process the positioning information and the charging level sent by large fleets of EVs; To efficient leverage of electric power and distributes it depending on the needs (taking into account EV battery state, its positioning, and the localization of the closer charging point); Gets mobility patrons to elaborate predictions on demand advancing unexpected peaks or surpluses of energy; Influences on users demand by tariffs and geographic variability.
- GNSS infrastructure (GPS, EGNOS, Galileo).

Status / Achievements

It has already been developed the OBU, as well as the positioning system, along with the application for smartphone to keep users informed on-real time about EV conditions and network. Currently we are in the development phase of the energy management system and management information back office; later start field tests with system integration in electric vehicles to begin creating patterns and validate the operation of entire system.

Partners

- FICOSA.
- GTD Information Systems S.A.U.
- Mobecpoint.
- Edenway.
- Private Foundation Ascamm - Aerospace Technology Centre (CTAE).

Fast In Charge

Innovative fast inductive charging solution for electric vehicles

Project Information:
Duration: 3 years
Funded by: FP7
Webpage: www.fastincharge.eu

Coordinator:
Dionisio del Pozo
TECNALIA
e-mail: dionosio.delpozo@tecnalia.com

Motivation and objectives

The overall objective of FastInCharge is to foster the democratization of electric vehicles in the urban environment by developing an easier and more comfortable charging solution using a highly performing inductive module. With the advent of new electrified vehicles (EV) for application in the urban environment, a significant need exists to drastically improve the convenience and sustainability of car-based mobility. In particular, research should focus on the development of smart infrastructures, and innovative solutions which will permit full EV integration in the urban road systems while facilitating evolution in customer acceptance.
The proposed solutions should demonstrate the enhanced attractiveness of electric mobility, both in terms of convenience and reduced total cost of ownership, while showing how they ensure a correct relationship with the electric supply network and its requirements, as well as the economics of the needed investments.

Technical approach

Within this context, activities will focus on:

- Investigation into alternative, innovative solutions for recharging stationary EV minimizing risks deriving from vandalism (e.g. inductive charging).
- Study of on-route charging technologies which would increase the vehicle range while reducing the size of on-board energy storage systems.
- Development of innovative location based Demand Management systems by means of intelligent systems integrated in both EV and charging stations that can communicate and manage adaptively the charging process autonomously, if necessary, or taking into account the priorities of the user-grid.
- Development of data security standards and crypto measures to ensure privacy protection.
- Intelligent coordinated systems (micro-grids) that balance the simultaneous demand of a given geographically location (multiple, slow and fast charging EV combined with other electric consumers) with policies that prioritize emergencies, security of the net, minimal autonomy for all the elements, etc., and that can also coordinate with neighboring microgrids and upper level electric grid control.

Projects may address these issues by technology development and demonstration from a technological perspective while focusing on business case analyses and impact studies demonstrating the feasibility and viability of the proposed solutions across a wide-range of operational situations.

Status / Achievements

On going project.

Partners

DBT, TUG, Automobilovy Klaster, Batz, Commune de Douai, Euroquality, ICS, TECNALIA, CRF.

Report on R&D in Energy and Automotive sector

Fundación General CSIC

Project Information:
Budget / Funding: Not applicable
Duration: One year
Funded by: Self funded
Webpage: www.fgcsic.es

Coordinator:
Míriam Ruiz Yániz
Fundación General CSIC
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Motivation and objectives

The study on R&D in *Energy and Automotive sector consists of a scientific* prospective exercise aimed at analysing present and future trends of research on the sector at global, European and national level. The study is based on a "holistic hypothesis-less approach", a methodology developed by Fundación General CSIC.

Technical approach

The methodology developed by Fundación General CSIC starts with a careful and exhaustive strategy design, specific to the subject of the Study, *Research on Energy and Automotive sector*. The first step consists of determining the variables to be taken into account and identifying the best information sources on the topic.
Once this searching strategy is designed, the exploitation of these information sources starts with the identification of key-concepts that will ensure the study contains all interesting aspects of the research activity on the field. That information is then conversed into knowledge through an analysis based on descriptive statistics, statistical inference and text mining, among other tools.
This methodology allows us identify the existing research capabilities in Spain, analysing them in terms of their relative position towards research studies carried out all around the world and trying to draw conclusions on three key aspects: (a) Main research lines developed so far, (b) Eventual needs of research and (c) potential trends that research on Energy and Automotive sector may follow in the future.
Finally, this study will be complemented with a survey to be launched among main stakeholders of the Energy and Automotive sector. Results and conclusions of the survey will feed the section allocated to research trends, as a tentative scientific prospective exercise.

Status / Achievements

On progress.

Partners

Fundación General CSIC- Analysis Unit.

FOTsis

European Field Operational Test on Safe, Intelligent and Sustainable Road Operation

Project Information:
Budget / Funding: 13.8 M€ / 7.85 M€
Duration: April 2011 - September 2014
Funded by: EC – Information Society & Media Directorate; 7th Framework Programme
Webpage: www.fotsis.eu (under construction)

Coordinator:
Miguel Seisdedos
Iridium Concesiones de Infraestructuras, S.A.
e-mail: mseisdedos@iridium-acs.com
Technical Coordinator:
Federico García-Linares (OHL Concesiones)

Motivation and objectives

FOTsis is a large-scale field testing of the road infrastructure management systems needed for the operation of seven close-to-market cooperative I2V, V2I & I2I technologies (the FOTsis Services), in order to assess in detail both 1) their effectiveness and 2) their potential for a full-scale deployment in European roads.
Specifically, FOTsis will test the road infrastructure's capability to incorporate the new cooperative systems technology at 9 Test-Sites in four European Test-Communities (Spain, Portugal, Germany and Greece), providing the following services:

- S1: Emergency Management.
- S2: Safety Incident Management.
- S3: Intelligent Congestion Control.
- S4: Dynamic Route Planning.
- S5: Special Vehicle Tracking.
- S6: Advanced Enforcement.
- S7: Infrastructure Safety Assessment.

Using an integral and comprehensive approach, FOTsis will therefore review the road infrastructure and communication networks required to secure a proper exchange of information between the traffic control centres (and all the information they already have available, enhanced with the V2I data) and the users/vehicles.
The project represents a major step forward to better connect vehicles, infrastructures and traffic management centres, the main focus being placed on the responsibilities of the road operator, aiming to contribute to the safety, mobility and sustainability challenges of nowadays.

Technical approach

Relying on the common European and open ITS architecture guideline proposal (supported by the project COMeSafety), FOTsis architecture is divided in three levels: functional level (the highest logical level), application level (relation between the logical functions and the physical elements) and the implementation level (physical elements). The architecture is based on cooperative systems and provides for an easy integration of new services when needed.

Status / Achievements

FOTsis started in April 2011. General Kick Off meeting held on 13 / 14th April, and on 20th May and 1st June Kick Off meetings for different Work Packages. First steps taken define final FOTsis communications architecture and coordination with other EC funded projects.

Partners

23 partners (highway operator, technology providers, universities, research centres, etc.)
8 countries (Spain, Portugal, Germany, France, Finland, Austria, Greece, Belgium)
9 Test Sites (2 in Portugal, 3 in Spain, 3 in Germany, 1 in Greece)

FREVUE

Validating FReight Electric Vehicles in Urban Europe

Project Information:
Budget / Funding: 14,251,642 € / 7,999,650 €
Duration: (03/2013 - 09/2017)
Funded by: FP7 - Transport
Webpage: http://frevue.eu/
Contact information (ITENE): jleon@itene.com

Coordinator:
Matthew Noon
Cross River Partnership - Westminster City Council
e-mail: MNoon@lambeth.gov.uk

Motivation and objectives

Eight of Europe's largest cities, will demonstrate that electric vehicles operating "last mile" freight movements in urban centres can offer significant and achievable decarbonisation of the European transport system. Demonstrators will be deployed in Amsterdam, Lisbon, London, Madrid, Milan, Oslo, Rotterdam and Stockholm. The demonstrators have been designed to ensure FREVUE covers the breadth of urban freight applications which occur across Europe. By exposing 122 electric vehicles to the day to day rigours of the urban logistics environment, the project will prove that the current generation of large electric vans and trucks can offer a viable alternative to diesel vehicles - particularly when combined with state of the art urban logistics applications, innovative logistics management software, and with well-designed local policy.

Technical approach

In the demonstrator of Madrid, in which de City Council is involved, the project will establish a consolidation centre from which electrical vehicles will do the last mile distribution for different Logistic Service Providers: SEUR, TNT and LECHE PASCUAL. The idea of the project demonstrator is to apply a fleet management software based on CANBUS technology to the electric vehicles tested in the project. A device installed in the vehicles will periodically collect data about the vehicle performance integrating it with the geographical information obtained by means of a GPS. The implementation of this data monitoring system will enable the real-time monitoring of the fleet from the control centre of the logistics service provider. The system developed by ITENE -Packaging, Transport and Logistics Research Center- will include an application for electronic cartography which will ease the fleet monitoring in real-time. An on-board application to the positioning and booking of the charging points for vehicles will be also developed. It will allow drivers to have access to all delivery route information as well as to the information about the charging points in order to increase the efficiency and productivity of the delivery performance.

Status / Achievements

The project started in March 2013 and currently the framework for the evaluation and execution of demonstrators is being developed. In this regard, the following tasks are being developed: Formalisation of demonstrator governance, Vehicle supply, Charging infrastructure installation, Design of new logistics operation and associated ICT solutions. In the case of the demonstrator of Madrid, the "Legazpi Market" has been selected as the consolidation centre. Regarding the vehicles, three different providers and models have been selected: Renault Kangoo Z.E., IVECO Daily Electric and Mercedes Vito E- Cell.

Partners

Westminster City Council, City of Amsterdam, City of Rotterdam, Stockholm, Oslo, Madrid City Council, Lisbon, Milan, Heineken, TNT, UPS, SEUR, CTT, Bring Express, Leche Pascual , UKPN, Fortum, ARUP, Renault , Smith EV, Nissan, ITENE, Imperial College, SINTEF, TNO, HyER , Polis, Swedish Transport Administration, ATOS, City of Lisbon.

G4V
Grid for Vehicles

Project Information:
Budget / Funding: 3.75M€ / 2.5M€
Duration: 2010 - 2011
Funded by: EC - FP7
Webpage: http://www.g4v.eu/

Coordinator:
RWE
Endesa Coordinator:
Narcís Vidal
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Motivation and objectives

The active demand and storage options that they bring about are considered important opportunities for the operation of networks and they further constitute a possibility to manage the negative impacts a mass introduction (EV and PHEV) could have on the grid.
The objective of G4V is to develop an analytical method to evaluate the impact of a large scale introduction of EV and PHEV on the grid infrastructure and a visionary "road map" for the year 2020 and beyond, taking into account all stakeholders and generating fast and openly available results.

Technical approach

G4V aims to provide a set of recommendations to support the evolution of the European electricity grids into an intelligent power system of the future which can efficiently integrate and serve as mass market of PEV's in Europe by offering a variety of services and products to meet the requirements of a wide range of involved stakeholders.

Partners

Endesa, RWE, EDP, EDF, Enel, Vattenfall, Chalmers, ECN, Imperial College London, RWTH, UPV, TU.

Green-Car Eco-Design

Eco-Design for Eco-Innovation: the Green-Car case

Project Information:
Budget / Funding: 1 ,168,699.00 € / 876,524.25 €
Duration: 01/2011 - 12/2012
Funded by: Territorial Cooperation Programme for the Southwest European Area (ERDF) -INTERREG IVB SUDOE
Webpage: www.greencar-ecodesign.eu

Coordinator:
Nuria García Rueda
CARTIF Centro Tecnológico
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Motivation and objectives

One of the specific actions in the framework of the European strategy on clean and energy efficient vehicles [COM(2010)186 final] is related to the determination of the environmental impact of electric vehicles using a life cycle approach, that is the core motivation of the project: to increase the knowledge of the Life Cycle Environmental Impact of the different main components of EV and transfer the achieved results to the stakeholders. By means of the introduction of environmental considerations from the design stage of those components, the environmental impact caused by them throughout their whole life cycle can be reduced and eco-innovated prototypes can be developed. The complete vehicle will be virtually simulated, in order to ensure the coordination of the eco-redesigned components and the best use of energy.

Technical approach

The methodology that will be used to model and assess the environmental impact is Life Cycle Assessment, that follows a scientific and systematic procedure according to the international standards ISO 14040 series. The project will cover the whole value chain of the product-system "electric vehicle" through the work of the partners in the different involved components (including prototyping): Charging points (CARTIF), Brake system (CTM), Converter (EPS-MU), Air conditioning systems (IAT), Auxiliary systems powered by renewable energy (ESTIA), Batteries (IPS), complemented by ITA with the integration of this knowledge to the entire EV, with special attention to the energetic features and the analysis of the implications that the introduction of these new vehicle components has on the other systems.

Status / Achievements

The work package nº2 entitled "Electric Vehicle Subsystems and Implantation Implications" has been finished with the delivery of a report that includes:

- State of the art of the Electrical Vehicle and its main components.
- Renewable energy sources that can be used by EV.
- List of legal requirements applicable to the whole system.
- SWOT analysis for the EV widespread integration.
- Identification of the final car topology to be studied.
- In addition the project corporate image and website have been developed.

Partners

Fundació CTM Centre Tecnològic (CTM), Mondragon Goi Eskola Politeknikoa S.Coop. (EPS-MU), Fundación Instituto Andaluz de Tecnología (IAT), Instituto Tecnológico de Aragón (ITA), École Supérieure des Technologies Industrielles Avancées (ESTIA), Instituto Politécnico de Setúbal (IPS).

GeM
Green Emotion

Project Information:
Budget / Funding: 42 M€ / 24 M€
Duration: March/2011 - March/2015
Funded by: European Comission (FP7)
Webpage: www.greenemotion-project.eu

Coordinator:
Narcis Vidal Tejedor
ENDESA, S.A.
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Motivation and objectives

The Green eMotion project is part of the European Green Cars Initiative (EGCI) that was launched within the context of the European Recovery Plan. It supports the achievement of the EU's ambitious climate goals, such as the reduction of CO_2 emissions by 60 percent by the year 2050. EGCI supports the research and development of road transport solutions that have the potential to achieve sustainable as well as groundbreaking results in the use of renewable and non-polluting energy sources.
The Green eMotion project was officially launched by Siim Kallas, Vice President of the European Commission, at a high-level kick-off meeting in Bruxelles on 31 March 31 2011. Within four years, it will be working to prepare the foundation for the mass deployment of Europe-wide electromobility.
The Green eMotion consortium consists of forty-three partners from industry, the energy sector, electric vehicle manufacturers, and municipalities as well as universities and research institutions. They have joined forces to explore the basic conditions that need to be fulfilled for Europe-wide electromobility. The primary goal of the project is to define Europe-wide standards. To this end, practical research is being conducted in different demo regions all over Europe with the aim of developing and demonstrating a commonly accepted and user-friendly framework that combines interoperable and scalable technical solutions with a sustainable business platform. For the implementation of this framework, Green eMotion will take into account smart grid developments, innovative ICT solutions, different types of EVs, as well as urban mobility concepts.
Endesa Leads the Demoregion ES1, that involves the regions of Barcelona and Málaga.

Status / Achievements

Green eMotion validates the performance of EV technology in terms of durability, costs, and safety factors under different climatic conditions. The purpose is to validate range, battery, safety equipment etc. under real-life driving conditions. The ultimate goal is a uniform Europe-wide system that can overcome all the challenges of weather and climatic conditions as well as differing usage patterns.
The All-Russian EV and Charging infrastructure forum –Electromobiliada 2013– took place recently in Moscow. Senan McGrath of ESB eCars Ireland gave a presentation on progress with the Green eMotion Project and in particular issues of interoperability, business models and experience sharing. He invited Russian demonstration projects to join the Green eMotion External Stakeholder Forum which meets twice year. The next Forum meeting is in Barcelona in November.

Partners

ENDESA, S.A. ; ENEL DISTRIBUZIONE; SIEMENS; IBM; ALSTOM; IBERDROLA; SAP; RWE.

GINA
GNSS for Innovative Road Applications

Project Information:
Budget / Funding: 2.2 M€ / 1.3 M€
Duration: 2008 - 2011
Funded by: GSA - Collaborative Project
Webpage: www.gina-project.eu

Coordinator:
Sara Gutiérrez Lanza
GMV
e-mail: sgutierrez@gmv.com

Motivation and objectives

GINA (GNSS for INnovative road Applications), a project commissioned by the GSA with funds from the European Commission's 7th Framework Programme for Research and Technology Development, addresses the adoption of EGNOS/Galileo in the road sector with regards to 3 specific aspects: its technical feasibility on a large scale, its economic viability and its positive impacts on issues such as congestion and pollution.
Growing mobility needs, coupled environmental constraints, require a more efficient use of existing road infrastructure. In this context, the idea of road charging as a means of managing traffic volumes by making users pay per their emissions has recently been introduced amongst Europe's policymakers. A GNSS-based road user charging allows for flexibility and scale in a cost efficient manner. The GINA project aims at carrying out a large scale demonstration in the Netherlands involving more than 100 vehicles.

Technical approach

In order to meet the defined requirements by real tolling operator schemes, the GINA project produced a system architecture based in the following modules: a simple and cheap OBU with a GNSS-based unit to provide position & speed information, EGNOS GNSS European system to enhance GNSS accuracy, an odometer based data for precise distance calculation and, finally, navigation algorithms for increased system performance.
The END2END trials were most focused in high level system performance for a large scale demonstration recording user data, and allowing them to check invoices and provide feedback with regard to system performance and charging scheme viability.

Status / Achievements

- The analyses carried out in GINA confirmed that GNSS is a reliable tool for different RUC schemes and that GINA proposed technology allows distance-based charging with good performances and a simple affordable solution.
- EGNOS use in the GNSS solution provides a performance increase in terms of accuracy and location in some scenarios tested during the trials.
- System performance results in line with the requirements set by real tolling operators proposed scheme in the Netherlands.
- Real large scale demonstration with 100 Vehicles and real users implementation.
- Users feedback received showing willingness to adapt proposed solution (related to final system monthly costs) and willingness to modify driver behaviours in order to save money/time and energy while employing such systems.

Partners

GMV (Spain) –project leader–, ERF (Belgium), Ian Catling Consultancy (UK), Bain&Co (Italy), TRL (UK) , Denarius professional (UK), Mapflow (Ireland), NAVTEQ (Netherlands), CENIT (Spain), AENOR (Portugal), ARVAL (Netherlands).

GREENLION

Advanced Manufacturing Processes for Low Cost GREENer Li-ION Batteries

Project Information:
Budget / Funding: 8.6 M€ / 5.6 M€
Duration: 11/2011 – 11/2015
Funded by: FP7 Green Cars-Large Scale Collaborative Project
Webpage: www.greenlionproject.eu

Coordinator:
Dr. Iosu Cendoya
IK4-CIDETEC
e-mail: iosucendoya@cidetec.es

Motivation and objectives

The project aims to the development of new chemistry/technologies based on innovative materials and processes in this manufacturing value chain, allowing for the more environmentally friendly production of the battery components; the substantial shortening of the battery assembly procedure, and the easier and more effective disassembly and end-of-life recycling.
GREENLION project focuses on the manufacturing of greener and cheaper Li-Ion batteries for electric vehicles via the use of water soluble, fluorine-free, high thermally stable binders.

Technical approach

GREENLION project addresses the following issues:

- At the electrode processing stage, developing and making use of aqueous slurries rather than toxic organic volatile compounds.
- At the cell assembly level, improvements to the existing procedures will be developed to increase energy efficiency and shorten times during the manufacturing process.
- At the battery module level, lighter designs keeping safe operation, targeting also easy disassembly processes for maintenance and reuse/recycling. Automation of module assembly process.

Status / Achievements

Among the main achievements, are to be highlighted:

- Coating trials have been carried out on a pilot machine, allowing the adjustment of parameters to achieve an excellent uniformity of the coated layer.
- Prototype cells were assembled as baseline for the project, from electrodes prepared with commercially water-soluble binders and graphite/LiFePO4 chemistry.
- The design of a lighter battery module for automated assembly and easier disassembly is ongoing.

Partners

IK4-CIDETEC (coordinador), CEGASA, TECNICAS REUNIDAS, MONDRAGON ASSEMBLY, SEAT, VW, KIT-HIU, POLYTYPE CONVERTING, KEMET, POLIMI, ENEA, UNIVERSITY OF LIMERICK, SOLVAY, TIMCAL, AIT, RESCOLL.

HBC
HELLOBYECARS

Project Information:
Budget / Funding: Private investment
Duration: 10/2010 - 05/2011
Funded by: GESTIÓN MOVIL MADRID, S.L.
Webpage: www.hellobyecars.com

Coordinator:
Ricardo Marco Budé
HelloByeCars
e-mail: ricardomarco@hellobyecars.com

Motivation and objectives

Hello Bye Cars is a startup company which business model is based on low prize car rental under previous reservation and usage on demand. Target is to place on market an efficient, clean and sustainable solution based on urban, hybrid and electric cars, attuned to the needs of mobility of the main urban areas, especially in places with big affluence of potential users (train stations, airports, etc.) where the different cars are based.
The objective is to develop a system which users will be able to open and to make use of a previously reserved car (via internet, mobile phone, etc.) using their unique contact-less card, without any human interaction, and then leave it in the same parking or in any other, being charged uniquely by the use (time, travelled distance) given to the car.

Technical approach

Each car is equipped with a GPS/GPRS unit and a contact-less car reader. The On Board Unit (OBU) is in communication with the platform in charge of the reservations, to which users can access via web at any time in order to choose any available car at any available time slot. This information, including user ID, is sent to the OBU (by means of an intermediate Back Office), so when the client uses its contact-less card in the windscreen, the system authorizes it and opens the car unlocking the engine.
At the end of the reservation period, or at any time within it, user can finish the reservation by using a touch PND. The information is sent to the invoicing platform through the Back Office so user is automatically charged according to the actual use of the vehicle, without any human interaction.

Status / Achievements

System is fully functional and the cars belonging to the HelloByeCars fleet can be found in different public parkings in the city of Madrid. Currently the expansion to other cities of Spain is taking place.
This project is an example of how low emissions vehicles are promoting new mobility models as part of public transport systems.

Partners

GESTIÓN MÓVIL MADRID, S.L. (HelloByeCars founder), GMV (OBU and Back-Office), Nervia (reservation and invoicing platform.

HINTERPORT

Promotion of HInterland transport cooperative solutions for iNTEgrated opeRation of sea-inland PORTs 0

Project Information:
Budget / Funding: 2,242,637 € / 1,121,319 €
Duration: 24 months
Funded by: Marco Polo Programme
Webpage: http://www.hinterport.eu/

Coordinator:
Angelo Aulicino
Interporto Bologna
e-mail: aulicino@bo.interporto.it

Motivation and objectives

HINTERPORT is a common learning action funded by the European Marco Polo programme which aims to become a real landmark for the world of intermodal transport in Europe. The concept is directly connected to the notion of transport logistics stakeholder's cooperation in a variety of themes such as Operational, Legal/Business and Infrastructural.
HINTERPORT aims at establishing an interactive network of intermodality related stakeholders (more than 40 already joined), in order to capture available success stories from across-Europe transport business cases, validate their applicability and viability and promote them through training/dissemination activities using innovative methods and ICT tools.

Technical approach

A well-defined working plan foresees a series of actions and events that will allow the:

- Expansion of the relevant actors' network and establishment of the HINTERPORT Forum (HF).
- Development of various thematic Blueprints supporting the port hinterland integration based on justified Best Practices.
- Introduction of user friendly ICT means for distance awareness and learning.
- Execution of detailed and innovative training and dissemination programs which facilitate the wide market penetration and operational sustainability even beyond the life of HINTERPORT.

Status / Achievements

HINTERPORT presented a set of good practices of sea-inland ports integration considering the driving forces for such actions and the prerequisites imposed by the transport operators towards the implementation of these practices.
The business and operational features, the organizational models etc. of the cases are being documented in the HINTERPORT Blueprint, providing a practical guideline for extrapolation of the practices in other business cases. Advanced ICT means for the implementation and communication of the gathered practices will be used in order to a) provide a user friendly demonstration of applicability and b) wide and ongoing dissemination to the HINTERPORT users community.

Partners

Interporto Bologna, Deutsche GVZ, Epad Ouest Provence; Puerto Seco Azuqueca; Terminal Intermodale Nola; Trieste Marine Terminal; Akarport, S.A.; Port of Antwerp; Port of Tallinn; Luka Koper, Autorità Portuale di Napoli; Italcontainer; Emons Spedition; Lithuanian railways; Valenciaport Foundation; AFT-IFTIM and ITENE (Instituto Tecnológico del Embalaje, Transporte y Logística www.itene.com).

HIRIKO
A new concept of urban mobility

Project Information:
Budget / Funding: 50 M€
Duration: 3 years, starting in November 2009
Funded by: Ministerio de Ciencia e Innovación / Gobierno Vasco / private funding
Webpage: www.hiriko.com

Coordinator:
Carlos Fernández
Denokinn
e-mail: cfernandez@denokinn.eu

Motivation and objectives

The HIRIKO concept was promoted by the Spanish associations AFYPAIDA, Denokinn and the MIT (Massachusetts Institute of Technology) on in November 2009. MIT did already work on the car and the mobility concept surrounding it since 2003. In February 2010, the consortium as we see it today was founded. Hiriko is not only a car, it is a concept of future urban mobility. More concrete, the vision of the Hiriko concept is the following:

- Proposes an alternative solution for social sustainability addressing the problems of urban mobility.
- Plans a multi-business scenario based on its center-piece urban electric car on which series of functions and associated services will be established.
- Is based on principles giving solutions to citizens and stakeholders to generate sustainable urban mobility systems, providing solution as a "Mobility-on-Demand" (MoD) system.

Technical approach

The HIRIKO concept implies charging stations, designated parking slots, 'Drive-on-Demand' or 'Mobility on Demand' renting system, up to the bank supported charging system. In addition, it brings an entire new concept of worldwide local assembling of modules (component groups), which guarantees quality consistency all over the world and allows an extremely competitive price.

Status / Achievements

The first prototypes of the HIRIKO vehicle have been produced. The HIRIKO car is designed to transport 2 people in the city, is driving max. 80 km/h, and the batteries are limiting the range to about 120 km. When parked, the car can be folded by pulling the back wheels further under the car. This also enables the passages easier to enter and exit the car through the front door. Some more key data for the 2 passenger car are: Reduced dimensions (2.5 x 1.6 x 1.5 metres and 1.5 x 1.6 x 1.9 metres folded); autonomy up 120 kms; power: 15 nominal Kw; Driving by wire, four wheel autonomous, integrating steering (AWS) and power.

Partners

AFYPAIDA; DENOKINN; MIT (Massachussets Institute of Technology); GUARDIAN; MASER MIC; SAPA; FORGING PRODUCTS; BASQUE ROBO WHEELS (BRW); TMA; INGEINNOVA and INGETEAM.

i-Copilot

Asistente Inteligente a la Conducción

Project Information:
Budget / Funding: 500,000 €
Duration: 9/2012-12/2014
Funded by: MINETUR- AVANZA 2012

Coordinator:
Jorge Villagrá
Ixion Industry & Aerospace
e-mail: jvillagra@ixion.es

Motivation and objectives

i-COPILOT seeks to go beyond the state of technology in Advanced Driver Assistance Systems (ADAS) by developing an intelligent assistant for drivers both in urban and highway scenarios, providing thus the basis to make significant progress in highly automated driving systems. The project aims to develop and industrialize ADAS able to automatically:

- Identify the environment layout (road streets, intersections, roundabouts, merging ways in highways...).
- Analyze the driving context (traffic lights and road signs detection and identification).
- Perceive the presence of potentially dangerous agents (cars, trucks, bikes, pedestrians) and estimate its evolution.

All this information is, together with the available V2X communication data, intelligently gathered to obtain a semantic interpretation of the environment, and thereafter, a quantified estimation of the potential risks for the driver at any moment and driving situation.

Technical approach

- Advanced filtering techniques are used for precisely estimate the vehicle positioning from the on-board COTS automotive sensors (GPS, IMU, stereo vision systems, LIDARs) and additional information provided by digital maps.
- Last generation Bayesian methods are used both for objects detection-tracking in a multi-sensor setting and for risk inference.
- Hardware-software co-design is used to accelerate the intensive signal processing and embed the whole system on a SoC, combining FPGA and multicore ARM processors.

Status / Achievements

- Localization and perception stages are in an advanced phase of development.
- Situation awareness and HMI development are in a preliminary design process, which is intended to be aligned with partners and customers requirements.

Partners

- Ixion Industry & Aerospace.
- Chispa Public Car system.

ICT4EVEU

ICT Services for Electric Vehicle Enhancing the User-Experience

Project Information:
Budget / Funding: 4,400,000 € / 2,200,000 €
Funded by: CIP-ICT-PSP type Pilot B
Webpage: www.ict4eveu.eu

Coordinator:
Carlos López Ruiz
GOBIERNO DE NAVARRA
e-mail: carlos.lopez.ruiz@cfnavarra.es

Motivation and objectives

The objective of the project is to deploy of a set of ICT-based services for EV focused on the integration of innovative technologies enhancing the user experience with an increasing geographical scope for the pilots: urban, regional and transnational Furthermore, the project will contribute to the European goal of creating a sustainable transport system with lower carbon emissions.

Technical approach

The project specific technical objective are:

- To make the driver aware of the EV's remaining energy and of the resulting restrictions in terms of range and comfort.
- To recommend and guide the driver to the most suitable recharging station, according to the battery status and the grid availability.
- To conveniently book a charging point in advance at the suggested station. The payment procedure is simplified with different charging point managers and receiving notifications (email, SMS, etc.) when the EV is conveniently charged.
- To guarantee access to reviews including information regarding the charging history, events and charging stations utilised.

The services to be developed focus on the integration of heterogeneous technologies into a common General Management System, managed by a determined party and then accessed by the users to receive the information needed about the charging network across the geographic area.

Status / Achievements

Three pilots are running in the project:

- Bristol (UK): Urban area pilot.
- Pamplona (ES) and Vitoria (ES). Urban and inter-regional pilots. Connecting two cities located in different regions within a 100Km distance.
- Ljubljana (SI) and Maribor (SI). International pilot: connecting the major cities in Slovenia. It would also count with observers from Austria, to extend in the future the results of the project opening the scope of the proposal to an international level.

Partners

Government of Navarra (ES), Ayuntamiento de Pamplona (ES), TECNALIA (ES), Iberdrola Distribución (ES), INGETEAM Power Technology (ES), Ente Vasco de la Energía (ES), Bristol Council (UK), ETREL (SI), Elektro Ljubljana (SI), Elektro Ljubljana Ove (SI), Elektro Maribor (SI), B.I.M. (AU), Landes Energie Verein (AU), Fundación CETENA (ES), Centro de Empresas e Innovación de Navarra (CEIN) (ES), CEA- Estudios Medioambientales (ES), Zabala Innovation Consulting (ES).

ID4EV
Intelligent Dynamics for Fully Electric Vehicles

Project Information:
Budget / Funding: 6,306,136 € / 3,799,402 €
Duration: 06/2010 – 08/12
Funded by: ICT for the Fully Electric Vehicle
Webpage: www.id4ev.eu

Coordinator:
Continental Engineering Services GmbH
Patrick Spall
E-mail: patrick.spall@conti-engineering.com

In IDIADA:
Jonathan Webb
IDIADA Automotive Technology
e-mail: jwebb@idiada.com

Motivation and objectives

The purpose of the project, which is co-funded by the European Commission, is to develop vehicle components and systems that satisfy the distinct requirements of fully electric vehicles. Both central electric drivetrains and wheel hub drivetrains with their unique driving comfort challenges fall within the scope of the project. Continental Engineering Services is leading the consortium; the other partners are fka, Renault, ZF Friedrichshafen, Chalmers University of Technology, Applus IDIADA, TNO and ICOOR.
The consortium has set high goals focusing on driving safety, comfort and energy efficiency. The objective is to offer the drivers of future fully electric vehicles products with the highest levels of safety, comfort and usability, leading to greater customer acceptance and, thus, quick and widespread market penetration.

Technical approach

The development and improvement of the most important vehicle systems is being driven from the perspective of active safety and comfort (brakes and chassis). The development will lead to new approaches for vehicle control and optimized synergetic interaction between individual systems. Within the framework of this project, these systems will be optimized to utilize their full potential. At the full-vehicle level a human-machine interface is being designed to optimize the usability of electric vehicles. Extensive testing in the form of test drives and hardware-in-the-loop (HIL) testing will bring the work to a close. Finally, the developed systems will be presented in demonstration vehicles.

Status / Achievements

Project ID4EV is up and running.

Partners

Continental Engineering Services GmbH (Coordinator); fka - Forschungsgesellschaft Kraftfahrwesen mbH Aachen; Renault; ZF Friedrichshafen AG; Applus IDIADA; Chalmers University of Technology; TNO - Nederlandse Organisatie voor toegepast natuurwetenschappelijk onderzoek; ICOOR - Consorzio Interuniversitario per l'Ottimizzazione e la Ricerca Operativa.

IEB
Irizar Electric Bus

Project Information:
Budget / Funding: 6,577,281 € / 2,075,087 €
Duration: Jan/2011 - Dec/2013
Funded by: SPRI - ETORGAI PROGRAMME

Coordinator:
IRIZARS, S. COOP.
e-mail: holabe@irizar.com

Motivation and objectives

Movement of vehicles in the city is slow; between 25% and 40% of their time spent at traffic lights or otherwise stationary, drastically raising CO_2 emissions. To avoid this, the transport sector is working intensely on developing electric vehicles which reduce dependence on fossil fuels and, thus, the emission of contaminant gases.
IEB consists of developing a new electric bus that will overcome current technological challenges regarding structure, the drive system, the generation and storage of energy, communications as well as control and operation, and which will definitively boost the bus as the best alternative for the mass transit of persons in urban environments.

Technical approach

The technical targets of the project are to:

- Guarantee a battery life of 350 Km, by developing optimum battery modules for the generation of auxiliary energy.
- Substantially increase the safety of urban buses by incorporating specific criteria at the top range sector in which IRIZAR works.
- Drastically reduce the weight of the vehicle through the incorporation of aluminium and other light alloys such as in the main material of its structure, this being a highly relevant technological challenge.
- Increase the energy performance of the electric machine + inverter set, even reaching 95% at its points of maximum efficiency, by developing optimised and reliable electronic control, and recovering energy in braking processes.
- Increase the reliability of the vehicle by using new algorithms for more efficient and more rapid response energy control.
- Boost safety and comfort when driving the new urban transport vehicles, with new aid, information and vehicle control systems which reduce the risks of distraction and collision.

Status / Achievements

During the last 34 months most of the works have been carried out with success. Thus, the consortium will finalize the complete prototype of the fully electric bus before the end of 2013.

Partners

Apart from IRIZAR, participating in the project are JEMA and DATIK companies working with CEIT, TECNALIA and VICOMTECH Technological Centres. After the finalization of the project, DonostiBUS will be the company that will test the bus prototype in a real environment.

IMCIS

Research of Sustainable Intermodal Freight Means

Project Information:
Budget / Funding: 5,939,699.30 € / 2,087,819.28 €
Duration: 01/2011 - 12/2012
Funded by: ADE Investments and Services
Website: www.imcis.es

Coordinator:
Mauricio Aguilar Talavera
e-mail: mauricio.aguilar@proconsi.com
Technical Coordinator: CARTIF
Melania Vasilica Istrate
e-mail: melist@cartif.es

Motivation and objectives

The project fits in with initiatives in the framework of sustainability, going to achieve compliance from Directive 2009/33/EC of reducing gas emissions and improve air quality.
IMCIS's main objective is to generate knowledge by investigating various means of intermodal freight load, to optimize and ensure the sustainability. We want to provide a qualitative and sustainable step ahead, giving the opportunity to modernize the sector and increase competitiveness, based on the use of new materials and structures, incorporating new technologies and methodologies and using renewable energy wherever possible.
The research conducted in the IMCIS project seeks to address three issues: need for an intermodal container lighter and resistant, searching for sustainability and innovation based on new technologies bringing added value to the process.

Technical approach

Research to design a smart container, studying the implementation of recycled materials, composites and high strength steels from the point of view of the structural skeleton, giving the whole functionality and versatility. We also study the possibility of applying suitable coatings from all points of view (security, explosions, tops, etc.) sustainability (eco-design), functionality, ease of maintenance, etc.), both external and inmates, including the latest developments based on functional coatings (nano).
Information systems able to provide "intelligence" processes related to the means of intermodal freight and enabling full control over the parameters of interest in real time, design of a common communication platform between, and incorporation of methods of energy supply through renewable embedded devices are some matters in the project.

Status / Achievements

The completion of the project IMICIS will provide:

- Increased competitiveness in the logistics sector.
- An increase in the efficiency, safety and quality in the means of intermodal freight.
- A listing of new technologies to improve the management and control of the entire logistics chain, including reverse logistics.
- A reduction of energy dependency and environmental impact.
- Have a different infrastructure to compete on the basis of cost optimization.
- A reduction of pollution and traffic congestion.
- Rationalization and reduction of economic and environmental costs.

Partners

Companies: ATOS ORIGIN, CASTLE AERO, DEIMOS DAT, PROCONSI, NEORIS, TALLERES MAC, EMERIX, SYMBIOSIS / Research Organisations: CARTIF Centro Tecnológico, CTME.

INNELBUS

Innovative technologies for pure electric urban buses development

Project Information:
Budget / Funding: 1 M€
Duration: 2010 - 2012
Funded by: National Plan for Scientific Research and European Regional Development Fund (ERDF)

Coordinator:
Antonio Barreiro Bravo
Carrocera Castrosua
e-mail: antonio.barreiro@castrosua.com

Motivation and objectives

Due to the experience obtained in other collaborative projects, like TECMUSA, the partners involved in present project INNELBUS have planned to develop a high dimensions urban bus with pure electric powertrain. It should be a high innovative product in the market which has to empower the electrification of urban transport and to develop new regulation about environmental impact of this kind of vehicles.

Technical approach

Main working areas are the following:

- Environmental impact analysis, through cycle life and well-to-tank studies.
- Structural optimization and mechanical requirements studies.
- Powertrain optimization.
- Issues around electric vehicle safety studies.

Status / Achievements

Nowadays, the project has achieved some goals about life cycle and well-to-tank analysis. It has been also developed some simulation tools in order to optimize the structure of the bus and electric powertrain tests are close to start on a test bench. A wide study about safety regulations has been also made to develop some regulation recommendations.

Partners

CASTROSUA, INSIA-UPM, AVIA INGENIERIA.

INT-CARSVAL

«Regional Study for the Development of a Standard and Interoperable CARSharing in the Valencia Community»

Project Information:
Budget / Funding: 68,948 € / 38,474 €
Duration: Julio/2010 - Abril/2011
Funded by: CIVITAS Activity Fund – "Cleaner and better transport in cities"
Webpage: www.aven.es

Coordinator:
José-Vicente Latorre Beltrán
Agencia Valenciana de la Energía
e-mail: latorre_jos@gva.es

Motivation and objectives

The principle of carsharing is simple: individuals gain the benefits of private vehicle use without the costs and responsibilities of ownership. Car sharing is most common in major urban areas where transportation alternatives are easily accessible. Car sharing has been studied and developed in Bremen (Civitas VIVALDI) , in Genova (Civitas CARAVEL), La Rochelle (Civitas SUCCESS), Rome (Civitas MIRACLES), Venice (Civitas Mobilis) and it is a measure to be developed in several Civitas Plus projects (like Modern, Mimosa, Renaissance). In Spain, car-sharing is still a quite marginal service, really present only in Barcelona city. AVEN, the Valencia Agency for Energy in the Valencia Region, has coordinated the project INT-CARSVAL which aims to perform an a regional study which aims is to share the carsharing experiences made in the most relevant CIVITAS Projects with the Valencia Region, in order to address it toward the simplest, friendly to use scheme to develop a new regional and interoperable Carsharing initiative in the Valencia Region.

Technical approach

The main strategic objective of the project has been the standardization of the technical solution required for the regional carsharing system to be implemented at the Valencia Community in order to guarantee interoperability in the overall region. The study has been mainly focused on an electric carsharing approach. This standardization process has included the different elements of the carsharing system:

- Central software platform required for the overall management service.
- Communications architecture between the charging station and the central platform.
- Physical and communications interface between the electrical vehicle and the charging station.

Status / Achievements

The main result of the project has been a strategic study performed for the Valencia Community. This regional study has analysed the main issues to be considered for a successful implementation of the carsharing system in the Valencia Region:

- Standardization of the technical solution and system operation.
- Business model and feasibility study.
- Benefits for the city and for citizens.
- Definition of the role to be performed by AVEN and the municipalities during the implementation and operation of the carsharing service.

Partners

The official partner is AVEN and the private enterprise MOVUS and the Spanish utility Iberdrola have participated as external experts of this project.

LABOHR

Lithium-Air Batteries with split Oxygen Harvesting and Redox processes

Project Information:
Budget / Funding: 2.9 M€
Duration: 4/2011 – 3/2014
Funded by: EC – FP7/PPP on Green Cars
Webpage: www.labohr.eu

Coordinator:
Stefano Passerini
Westfälische Wilhelm Universität Muenster
e-mail: stefano.passerini@wwu.de

Motivation and objectives

LABOHR aims to develop Ultra High-Energy battery systems for automotive applications making use of lithium or novel alloy anodes, innovative O_2 cathode operating in the liquid phase and a novel system for harvesting O_2 from air, which can be regenerated during their operative life without need of disassembling. LABOHR has 5 key objectives: (i) development of a green and safe electrolyte chemistry based on non-volatile, non-flammable ionic liquids (ILs); (ii) use of novel nanostructured high capacity anodes in combination with ionic liquid-based electrolytes; (iii) use of novel 3-D nanostructured O_2 cathodes making use of IL-based O_2 carriers/electrolytes with the goal to understand and improve the electrode and electrolyte properties and thus their interactions; (iv) development of an innovative device capable of harvesting dry O_2 from air; and (v) construction of fully integrated rechargeable lithium-Air cells with optimized electrodes, electrolytes, O_2-harvesting system and other ancillaries.

Technical approach

LABOHR aims to overcome the energy limitation for the application of the present Li-ion technology in electric vehicles with the goal to: 1- perform frontier research and breakthrough work to position Europe as a leader in the developing field of high energy, environmentally benign and safe batteries and to maintain the leadership in the field of ILs; 2- develop appropriate electrolytes and nanostructured electrodes which combination allows to realize ultra-high energy batteries; 3- develop a battery system concept as well as prototypes of the key components (cell and O_2-harvesting device) to verify the feasibility of automotive systems with: A) specific energy and power higher than 500 Wh/kg and 200 W/kg; B) coulombic efficiency higher than 99% during cycling; C) cycle life of 1,000 cycles with 40% maximum loss of capacity, cycling between 90% and 10% SOC; and D) evaluate their integration in electric cars and renewable energy systems.

Status / Achievements

Started April 1st, 2011.

Partners

Westfaelische Wilhelms-Universitaet Muenster (DE), Tel Aviv University (IL), Agencia Estatal Consejo Superior de Investigaciones Científicas (ES), Kiev National University of Technology and Design (UKR), University of Bologna (IT), University of Southampton (UK), SAES Getters S.p.A. (IT), Chemetall GmbH (DE), AVL List GmbH (AT), Volkswagen (VW, DE), European Research Services GmbH (DE).

LearnForm

Self-Learning sheet metal forming system

Project Information:
Budget / Funding: 4,766,374 €
Duration: apr/2009 – apr/2012
Funded by: Seventh Framework Programme/
Collaborative Project (FP7-NMP-2008-SMALL-2)
Webpage: http://www.learnform.eu/

Coordinator:
Mr. Peter Blau
Fraunfofer IWU
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Motivation and objectives

Deep drawing is a compression-tension metalforming process in which a sheet metal blank is radially drawn into a forming die by the mechanical action of a punch. It is thus a shape transformation process with material retention. The flange region experiences a radial tensile stress and a tangential compressive stress due to the material retention property. These compressive stresses often lead to flange wrinkles. The prediction of wrinkling are therefore of vital interest in sheet metal operations.
LearnForm's overall and most impact-driven objective is a radical substitution of today´s trial and error procedures in deep drawing by knowledge-based, self learning production system.

Technical approach

The key idea is to develop a self-learning sheet metalforming system which is based on energy control.
Intelligent dies will include forming process multi-sensors in order to give automatic information about local forces and feed rates to a condition-monitoring system. This will help to identify local changes in the forming process.
An open architecture motion control system adapts the parameters for the forming position, speed and the die gap control according to the identified process changes and product variants and the optimal die gap model.
Multiple die cushion axes will act with adaptronic force oscillation on the clamping forces between the sheet metal and the die in order to prevent a stick slip effect, a force overload, fissures or folds.

Status / Achievements

The period 1 (18 months) has been completed and the demonstrators have been constructed for automotive components (CIE) and household appliances industry (Gorenje). The expected sensors and actuators have been developed integrated into the tools and tested.
Currently the data obtained after the first try outs are being analysed to define the operating rules that will be used as basis for the control system.

Partners

Fraunhofer IWU, Tecnalia, CTU Prague, CEDRAT, Siemens, ERAS GmbH, Gorenje Orodjama d.o.o, Fundación CIE I+D+i.

LivingCAR

A living lab for studying the effect of using electrical vehicles and their related infrastructure in a real life environment

Project Information:
Budget / Funding: private + regional funding
Duration: started july 2009
Funded by: Initiative members / Regional Agency

Coordinator:
Paula Queipo
Fundación PRODINTEC
e-mail: pqr@prodintec.com

Motivation and objectives

LivingCAR is committed to demonstrating the potential of electromobility for certain usage scenarios, capable of stimulating the society and the market and linked to regional, national and international mobility plans. It is not only an open space for demonstration, but an example of collaboration between stakeholders. This Platform is a real demonstration scenario for extracting crucial information about:

- **Technical issues:** Technical advantages/disadvantages identification when using electrical vehicles (EVs) and the related infrastructure. Real impact measurement.
- **Social issues:** To identify the social barriers when utilising EVs by extracting data from the live experiments and by evaluating citizens' perception. To name and promote positive measurements, standards and new regulations.

Technical approach

LivingCAR is an open initiative that intends to involve people, companies, R&D centers, public agencies and users for the mutual benefit in the co-creation of new solutions, products, services and business models regarding electromobility. In order to carry out the different R&D activities, it counts with the following resources: 1. Electric vehicles: different types of vehicles from different manufacturers are being assay, monitored and evaluated. 2. Charging Points: The LivingCAR already counts with 14 installed slow charging points in the region. Two of them are monitored so that they charging curves can be extracted and analysed.

Status / Achievements

- EVs active fleet and charging network installed.
- EVs: Data of EV performance in real conditions analysed. Experiments are still ongoing.
- Products improvement: Ex.: charging point has been probed and redesigned.
- European Living Lab: first Platform on electromobility recognised as Living Lab by the European Network of Living labs (ENoLL).
- Society active awareness: Big social demonstrations organised with the objective of letting the citizens to participate as users and know the technology of the full EVs.

Partners

Public-private initiative: Fundacion PRODINTEC, Ayuntamiento de Gijon, Grupo Temper, Grupo ISASTUR, HC Energia, Banco Herrero, Autoridad Portuaria de Gijon, GAM, Prometeo Innovations, Oxigeno Empresarial, ITVasa and Ingenieros Asesores.

M²IA
Minimum Environmental Impact Mobility (FP7-266284)

Project Information:
Budget / Funding: 1 M€
Duration: January/2009 - December/2011
Funded by: Private
Webpage: www.cidaut.es

Coordinator:
Esteban Cañibano Álvarez
Fundación CIDAUT
e-mail: estcan@cidaut.es

Motivation and objectives

In order to contribute to sustainable mobility, Cidaut has researched future traction system possibilities. After studying the state of the art in this field, it was decided to implement in-wheel electric motors as the future approach for the electric vehicle. The first task completed in this project was to design and develop a technological demonstrator. This consists on a modification of an internal combustion engine vehicle into in-wheel motors, simplified in this case only to the rear axle.
This versatile vehicle has been used to test different traction system configurations, battery technologies, electronics and especially dynamic performance and control strategies, so as to enhance globally the efficiency.

Technical approach

In order to achieve this objective, the following scientific and technical objectives have been defined:

- Modification of an internal combustion engine vehicle into a electric one.
- Creation and real implementation of an approach to future in-wheel electric motors.
- Generation of new simple control strategies to adapt the dynamic behaviour of the vehicle not only to drive mode preferences but also to ambient or road conditions.
- Creation of a monitoring and information system (display) in real time for the driver with the operating conditions of both batteries and electric motors.

Status / Achievements

Initially, the modification and development of the technical demonstrator has been carried out with the introduction of several important improvements in the vehicle, taking into account the drawback of the limited autonomy. Moreover, a monitoring system to control the behaviour of the vehicle has been introduced. It can show information about the vehicle and its system, such as global velocity, steering wheel angle, wheel velocity, etc. It also measures in real time the performance of every cell of the batteries, given by their fundamental variables, like the temperature or the charge of each of them.
Secondly, numerical co-simulations between Matlab-Simulink and MSC.ADAMS/Car have allowed developing control strategies that they are later experimentally validated with the use of the demonstrator. The electronic equipment necessary has been conveniently programmed to have several possibilities for the control of the in-wheel engines as well as the battery control.

Partners

Coordinator: Fundación CIDAUT (Spain).

MARS-EV

Materials for Ageing Resistant Li-ion High Energy Storage for the Electric Vehicle

Project Information:
Budget / Funding: 9.2 M€ / 6.6 M€
Duration: 10/2013 – 10/2017
Funded by: FP7 Green Cars-Large Scale Collaborative Project

Coordinator:
Dr. Óscar Miguel
IK4-CIDETEC
e-mail: omiguel@cidetec.es

Motivation and objectives

Although already in the market place, lithium batteries still require progress to meet the requirements of the electric transportation market: e.g. increase of energy density and enhancement of service life on both cell level and battery level thanks to innovative materials and technologies and optimization of process characteristic. MARS-EV aims to overcome some of the main limitations by focusing on:

- Synthesis of novel nano-structured, high voltage cathodes and high capacity anodes (250 Wh/kg at cell level).
- Development of green and safe, electrolyte chemistries.
- Investigation of the electrolyte properties and their interactions with anode and cathode materials.
- Understanding the ageing and degradation processes with the support of modelling.
- Realization of up to B5 format pre-industrial pouch cells with optimized components and eco-designed durable packaging.

Technical approach

The technical approach of this project focuses on:

- Electrode materials.
- Gel polymer membranes with high mechanical properties, ecofriendly and reinforced.
- Li-ion cells from the lab-scale to the preindustrial scale will be realized as proof of concept and tested for the performance, lifetime and safety issues.
- Life Cycle Assessment taking into account the recyclability of the complete cells.
- Modelling at the materials level as well as the system level (cell ageing, SOH) will also guide the materials and cell development and testing.

Status / Achievements

The project is in the early stages of development.

Partners

IK4-CIDETEC (coordinator), CEGASA, KIT-HIU, POLITO, JM, SGL, TAU, ENEA, SOLVIONIC, LITHOPS, CTP, IMPERIAL COLLEGUE, FHG-ISE, OBU, RECUPYL, JMBS.

MERGE

Mobile Energy Resources in Grids of Electricity

Project Information:
Budget / Funding: 4.5 M€
Duration: 24 months (January 2010 – December 2011)
Funded by: European Commission - Collaborative Project
FP7-ENERGY – 2009 – 7.3.3 - Strategic impact of the roll-out of electric and plug-in hybrid vehicles on grid infrastructure
Webpage: www.ev-merge.eu

Coordinator:
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Public Power Corporation of Greece
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Spanish Contact:
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IIT-Universidad de Comillas
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Motivation and objectives

The project mission is the evaluation of the impacts that Electric Vehicles (EV) will have on the EU electric power systems regarding planning, operation and market functioning. The focus is placed on EV and SmartGrid/MicroGrid simultaneous deployment, together with renewable energy increase, leading to CO_2 emission reduction through the identification of enabling technologies and advanced control approaches.
It is important to understand that the deployment of electric mobility can be made without the need to reinforce the main existing power system infrastructures, provided that an advanced management and control solution is adopted – the MERGE control concept. This will be made by controlling EV battery loading and thus avoiding the peak load conditions in the electrical grid and in the generation system.

Technical approach

The conceptual approach that is developed in this project involves the development of a methodology consisting of two synergetic pathways:

- Development of a management and control concept that will facilitate the actual transition from conventional to electric vehicles - the MERGE concept.
- Adoption of an evaluation suite of tools based on methods and programs enhanced to model, analyze, and optimize electric networks where EV and their charging infrastructures are going to be integrated.

Status / Achievements

The project started in January 2010 and will finish in December 2011. By May 2011 the following deliverables are available; WP1 - Specification for an Enabling Smart Technology, WP2 - Developing Evaluation Capability, WP5 - Regulatory Issues and Business Models for Efficient Integration of EV.

Partners

The MERGE consortium is formed by:

- INESC Porto, Cardiff University, TU Berlin, ICCS/NTUA, Comillas Univerisity of Madrid, MIT.
- Public Power Corporation, Rede Electrica National, Red Electrica de Espana, Iberdrola, Regulatory Authority of Energy, Electricity Supply Board, E.ON.
- AVERE, Ricardo, IMRWorld, Consulting4Drive, InSpire Invest, Renault.

μDiesel
Diesel & downsizing limits

Project Information:
Budget / Funding: 350,000 €
Duration: (01/2010-01/2015)
Funded by: Ministerio de Ciencia e Innovación and Generalitat Valenciana
Webpage: www.cmt.upv.es

Coordinator:
Francisco Payri
CMT Motores Térmicos
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Motivation and objectives

Despite engine downsizing is a widespread technique to reduce vehicle energy consumption and emissions keeping similar vehicle performance, engines are still operating at partial load for most usual driving situations, which burdens fuel efficiency. A possible way to reduce the vehicle fleet energy consumption is to fit the vehicle power-plant to its real requirements, thus allowing the engine to run at more efficient conditions.
Accordingly, the μDiesel is a compact, light engine, providing high specific power (kW/l and kW/kg), and with a low power output (about 20-30 kW for small size vehicle concepts). Of course, since the reduction of fuel consumption is the driving factor of the μDiesel, it should have a similar efficiency than a state-of-art automotive Diesel engine, it is an efficiency around 40%.
Despite recent technological development has pushed the Diesel engine specific power beyond 50 kW/litre and brake mean effective pressure (BMEP) beyond 20 bar it is not currently possible to extend automotive CI engine technology to the low power region (about 20-30 kW). Hence, development of the μDiesel engine remains still a challenge due to limits associated with engine heat transfer (as geometrical and operation restrictions give rise to higher heat losses), limits related with the air management of the engine (most notably with turbocharging) and difficulties imposed by the intrinsic nature of injection and combustion processes with reduced space and time scales.

Technical approach

During the first phase of the project the methodology employed was eminently theoretical, using CFD codes and specific models to identify the limits of downsizing and the feasibility of a Diesel engine with a unitary displacement of around 150cm3. Then, after the assessment of the feasibility of such an engine, the second phase of the project consisted in the design of such an engine according to fuel efficiency and emissions criteria. The third phase is the construction of a prototype of the engine and in a fourth phase it will be validated.

Status / Achievements

Since 2010, theoretical and experimental studies focused on the definition and abatement of the limits imposed by thermo- and fluid-dynamic processes to the downsizing of diesel engines have been done in order to assess the μDiesel feasibility under the scope of project TRA2010-16205. After those studies, the engine is designed and a prototype is currently under construction. It is expected to start validation tests on the prototype at the beginning of 2014.

Partners

An industrial partner in the automotive sector is sought.

MOBI2GRID

Electromobility corridor in the Euro region Galicia / North of Portugal

Project Information:
Budget / Funding: 1.87 M€ / 1.41 M€
Duration: 27 months
Funded by: POCTEP - Operational Programme for Cross-border Cooperation: Spain – Portugal, 2007-2013

Coordinator:
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CEIIA - Centro para a Excelência e Inovação na Indústria Automóvel
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Spanish contact:
Ana Paul
CTAG
e-mail: ana.paul@ctag.com

Motivation and objectives

The main purpose of MOBI2GRID Project is to foster the adoption of electromobility based on renewable energy sources, through a pilot test of electric vehicles equipped with bidirectional vehicle to grid communication (V2G).

Technical approach

The specific actions to reach this objective are:

- To perform R&D activities related to development, testing and validation of the electromobility system based on renewable energy sources.
- To perform R&D activities related to the development of an advanced tele-diagnosis system for electric vehicles with real time data monitoring.
- To develop prototypes and pilot experiences in an electric mobility corridor (Vigo - Oporto), including user acceptance analysis of electric vehicles.
- To involve regional entities, companies and universities in the creation of the conditions to the generation and attraction of new investments associated to the development, production and testing of electromobility systems and solutions.

Status / Achievements

MOBI2GRID aims at the creation of the conditions for the application of an integrated and interoperable system between cross border regions. As a result, the project will promote the emerging industry of electromobility in the Euro region, fostering technological diversity, new job opportunities for highly qualified staff, and new investments.

Partners

CEIIA (Portugal), CTAG (Spain).

Mobinet

Europe wide platform for connected mobility services

Project Information:
Budget / Funding: 11 M€ (grant)
Duration: 1/Nov/2013 - 30/Jun/2016
Funded by: FP7
Webpage: http://www.ertico.com/europe-wide-platform-for-connected-mobility-services-mobinet

Coordinator:
Paul Kompfner
ERTICO - ITS Europe
e-mail: p.kompfner@mail.ertico.com

Motivation and objectives

The MOBiNET service platform aims to simplify the Europe-wide deployment of connected transport services by creating an "Internet of Mobility" where transport users' requests match providers' offers, and promoting openness,harmonisation, interoperability and quality.
MOBiNET is a collaborative project in the 7th Framework Programme of RTD of the European Union, co-funded with a grant of almost €11M and comprising a consortium of 34 partners including a wide range of actors and stakeholders representing the world of transport and mobility service users and providers.
MOBiNET will develop, deploy and operate the technical and organizational foundations of an open, multi-vendor platform for Europe-wide mobility services. Key MOBiNET innovations address the barriers to cooperative system-enabled service deployment, including the lack of harmonized services; availability of communication means; inaccessibility and incompatibility of transport-related data; fragmentation of end-user subscription and payment services; proprietary technologies in user devices; etc.

Objectives

MOBiNET will develop solutions for both business (B2B) users and end (B2C) users (e.g. drivers and travellers):

- A comprehensive directory of Europe-wide mobility and transport-related data and services.
- An e-Marketplace as an e-commerce network linking end users, content- and service-providers.
- Single sign-on MOBiNET membership & single payment account for end users.
- Membership of the MOBiNET B2B Supplier Community enables providers to add third-party content and services contract-free to their own products.
- A platform-independent agent on end-user devices, including access to a MOBiNET App Store and an intelligent communication & connectivity manager that hosts end-user services.
- The project will develop both a Service Development Kit to enable easy creation of MOBiNET user services and a set of uniform Reference Services suitable for Europe-wide deployment, including "eco-traffic management-as-a-service" and a multimodal traveler assistant.

Technical approach

MOBiNET central facilities will be hosted as cloud services available to the supplier community, and will be operational early during the project. These facilities will be taken up at a group of diverse pilot sites that will validate MOBiNET in trials aimed at learning from operators' and users' experience how to create, deploy and operate services in a Europe-wide platform.

Status / Achievements

On going.

Partners

34 Partners, leaded by Ertico.

MONDRAGÓN

Mondragon Electric Car & Range Extender

Project Information:
Budget: 26 M€
Duration: 2009-2015
Funded by: EU-7PM, Ministerio de Industria and Basque Government
Webpage: www.mondragon-corporation.com

Coordinator:
Mikel Uribe-Altuna
MONDRAGÓN Automoción, S. Coop.
e-mail: mikel@mondragonautomocion.com

Motivation and objectives

Mondragon Automocion is developing one relevant multi-annual project in the electric car area, developing new strategies for the electric car and new electric big components and systems.
These new strategies for Industrial production series are addressed to a new catalogue of Modular concepts and configurations of the new sector pillars, such as Range extender, Rolling chassis and Interior Equipment for complete cars towards specific purpose electric fleet vehicles.

Technical approach

This MONDRAGON relevant project is coordinated within a collaborative approach for the research and development activities between more than 20 companies, Referring to the complete car area and the Big Components, Range Extender and e-Motor, Rolling Platform and interior equipment.
Development of a new Fagor-Lotus Range extender, composed by a new flex-fuel Euro-6 eco-motor, a new generator+regulator, powertrain+regulator+charger and a new set of battery Li-Ion modules, all of them for their integration into new platform concept for the ER-EV - Extender Range Electric Vehicles (2010-2012).
Development of a new light advanced functional Rolling Platforms for cars and vans, integrating hybrid composite materials, boron steels and new aluminiums for the ER-EV - Extender Range Electric Vehicles (2011-2014).

Status / Achievements

Mondragon electric city-car concept and built prototypes were successfully presented in press in June 2010. New presentations of electric fleet vehicles and components are envisaged for 2013
FAGOR-Lotus Range Extender 2ndgeneration has been presented at the Genève Autoshow 2011. Latest developments have been focused in the product industrialisation. Final prototypes will be ready in autumn 2011. Productive series are foreseen for 2012-2013. 1stgeneration RE prototypes have been integrated in three complete cars.

Partners

Fagor Ederlan, Lotus Engineering, Maier, Cikautxo, Fagor Automation, Batz, Ecenarro, CEGASA, University of Zaragoza, Politecnico di Torino.

MOVELE
"Pilot Project for Charging Points in Barcelona"

Project Information:
Duration: 01/10 – 10/10
Funded by: Instituto para la Diversificación y Ahorro de la Energía, IDAE (Ministerio de Industria, Turismo y Comercio) - MOVELE Programme
Webpage: http://www.idae.es/index.php/mod.pags/mem.detalle/id.407

Coordinator:
Manel Torrent
Agencia de la energía de Barcelona

Ramón Gimemo
Grupo ETRA

Motivation and objectives

The MOVELE project is an initiative of IDAE which objective is to demonstrate the technical, economical and energy feasibility of electric mobility in urban areas.
In the context, Grupo ETRA has developed the "Charging point management system" that consists of a platform to monitor and manage all the electric vehicles charging points located in Barcelona urban area. This platform is the operation core of the system, as it concentrates all the activity and exchange of information.

Technical approach

Communications of the charging points with the management system will be carried out by means of GPRS communications. However, the system is ready to use other means of communication such as ADSL or optical fibre networks. The information that comes from the charging points will be treated by SIVA system "Sistema de Control de Acceso" and stored in the database. The different users of the system access to this information by means of a Web application.
This web application allows accessing to the system through internet to the various users: authorities, operators and drivers. The application is located on a server allowing access to the different users.

Status / Achievements

The system is already in use managing 56 charging points in Barcelona urban area.
The web application is available by means of the LIVE web page (http://www.livebarcelona.cat/web/guest). Through this web page, the users will access to the system by means of a personal username and password that will allow them to receive personal information.
On the one hand, a map will show to the drivers the charging point's location and status (out of order, available and not available) and on the other hand, information about users' behaviour, system management and other events will be sent to the authorities and providers.
Finally, this system will allow in the future other added value such as multimedia features or means of payment with RFID cards. In addition, the system will be able to incorporate an unlimited number of charging points from different manufacturers.

Partners

Grupo ETRA.
Agencia de la energía de Barcelona (Ajuntament de Barcelona).

MOVILOC

Platform for the deployment of Automotive Telematic Services

Project Information:
Budget / Funding: Internal R&D project
Funded by: Private
Webpage: www.moviloc.com

Coordinator:
Javier Paniagua Sanz
GMV
e-mail: javpan@gmv.com

Motivation and objectives

MOVILOC aims to be a horizontal common platform, which allows serving multiple applications that will lead to a new telematic services in the near future:

- **Electric vehicles** will rely on telematic services for achieving efficient energy management and for studying the battery performance with the time depending on actual weather conditions or topology.
- **eCall** (safety services): this is a subset of emergency services where an emergency call is generated either manually by occupants or automatically via activation of in-vehicle sensors.
- **Pay-As-You-Drive services:** this concept involves all kind of road applications where the driving profile of a user has an influence on the price policies of the service which is provided. It includes auto insurance or rent or leasing applications.

Technical approach

MOVILOC platform allows a vary group of OBUs (On-Board Units) to wirelessly send information to a control centre, where this information is processed and stored. The type of information is very diverse, going from PVT (Position, Velocity and Time) to different sensor data (temperature, tamper detection, diagnosis information, etc), since the philosophy to follow is One OBU – Multiple Services. That is, one single type of OBU is able to provide information for very different services like eCall, Pay as You Drive, Road Use Charging, Remote diagnosis, etc.
MOVILOC will operate as a Cloud service for Global access. The software service enables any corporation or individual to control, manage, optimize and view in real time the use of any type of moving vehicle. Commercial vehicle operators, will see immediate benefits and increase in profits as well as a reduction of CO_2 emissions.

Status / Achievements

The aim of this project is to demonstrate the technological feasibility of a cloud-based application experimenting and verifying the new business possibility for providing Telematic services. Moreover, drivers can also be conscious of their individual emissions of pollution helping to reduce the impact of their vehicles on the environment.
Current results are showing that the provision of such services is possible and Telematic services will allow the appearance of new mobility models, helping with vehicle and energy management, optimizing transport routes and reducing logistic costs taking as final aim the diminution of traffic congestion and the reduction of CO_2 emissions.

Partners

GMV.

M-Rueda

Development of in-wheel motor for electric vehicles

Project Information:
Budget / Funding: n/d
Duration: 2011-2013
Funded by: Gobierno Vasco. GAITEK

Coordinator:
Imanol Fernández
GAT Staff, S.L.
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Motivation and objectives

The main objective of this project is investigation and developing structural elements that have specifications of "corner module elements" from the use of in-wheel motor configuration, and allows a deep knowledge on the influence of this type of electrical topology components and how it affects currently to systems that the company produces.
The project will focus on two key elements important for STAFF GAT S.L. (hub wheel), as well as the integration of those new designed components in the global new concept structure of a electric powered car.

Technical approach

A high knowledge and development on materials, design and final function in the future electric car is going to be developed in the project.
A new design methodology will be used with specific tools (CAD and simulation) in order to match the behaviour of the complete system in the prototype phase.
Manufacturing technologies and requirements will be specially focused on project development.

Status / Achievements

On going project.

Partners

GAT Staff, S.L., Camelot 97, Tecnalia.

MUGIELEC

A comprehensive approach to EV recharge infrastructure

Project Information:
Budget / Funding: 10 M€
Duration: 09/2010 - 12/2012
Funded by: ETORGAI (Basque Government)
Webpage: http://www.mugielec.org

Coordinator:
ZIV
e-mail: Mugielec@mugielec.org

Motivation and objectives

MUGIELEC is a publicly funded R&D project initiative in the Basque area which has got together many important players in the energy sector in order to collaborate on EV related technology and applications, with a strong focus in the infrastructure side. The project comprises a complete system-level approach, covering from system-level grid operation, to the infrastructure-to-vehicle communication, including critical subsystems such as recharge infrastructure scenarios, impact on the grid, V2G technical feasibility, customer behavior analysis. The project has also a strong focus on promoting the standardization activities in the areas related to the research results obtained in the project by the partners.

Technical approach

MUGIELEC is going to analyze and develop the adequate infrastructure for recharging electric vehicles. In order to achieve the optimal integration of all the systems, communication and protocols will be properly specified, from the EV and charging point to the System Operator. On the other hand, EV management is to be integrated into the whole electricity grid, considering also the charging point and the stationary storage within the secondary substation.
Another key issue will be the development of business models and the adequate approach for the exploitation of the infrastructure for EV charging, and the information and data base management in order to provide adequate services to all the involved stakeholders.
In the project schedule, two demonstration areas are going to be developed: a parking lot system solution and a fast recharge station, in order to validate the developments carried out during the project.

Status / Achievements

The specification and requirement analysis phase, in order to go knee-deep in R&D activities, in all the areas of the project, is already finished or about to be achieved. First prototypes for information data base, control algorithms, charging points and secondary substations with stationary storage are well in progress.

Partners

The administrative lead of ZIV and technology coordination by TECNALIA, is formed by the following partners: AEG, Cementos Lemona, FAGOR, GAMESA, IBERDROLA, INCOESA, INDRA, INGETEAM, ORMAZABAL AND SEMANTIC SYSTEMS. Other entities and associations such as BEC and Energy Cluster are also participating as associated partners.

OASIS

SAFE, Intelligent And Sustainable Highways Operation

Project Information:
Budget / Funding: 30,5 M€ / 14,0M€
Duration: 2008 - 2011
Funded by: CDTI- Ministerio de Ciencia e Innovacion- SPAIN
Webpage: www.cenitoasis.com

Coordinator:
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Motivation and objectives

OASIS Project is created from a strategic necessity of the Spanish Infrastructure Concession companies to keep their competitiveness. The Spanish Concessional sector is located in a world leading position. OASIS pretends to increase this leadership, jeopardized by the entrance of new competitors from emerging economies with less personal and resources costs.To this end, differential elements will be generated in order its services' offer to be more attractive.
The differential factor pursued is the technological innovation; the aim is to settle the basis for the exploitation model of the future motorways, oriented to the improvement of the service, and the enhancement of the safety, from a sustainable point of view. The project has been divided in 7 work packages:

- Integrated concessional services (1) is the umbrella that will cover all requirements defined for the "new concession", and the results of the rest of the packages.
- In order to improve the service, lane closures due to pavement life cycle actions (2,3) will be avoided, and congestion will (5) will be reduced with the help of intelligent management systems.
- Specific measures (4) will be taken for the improvement of safety, in addition to the application of the existing ones (sensorization, active and passive safety, behavior algorithyms).
- In order to contribute the sustainability of the motorway, advances will be done in reducing the energetic footprint (6), and in the dynamic integration with the environment (7) during the exploitation phase.

-

Technical approach

Research effort has been oriented to the improvement in three fields, highly valuated by society: Services rendered to the users, active and passive Safety of the infrastructures, and Sustainability.

Status / Achievements

OASIS started in 2008 and finished in 31st of December 2011.

Partners

31 partners (3 highway operator, 4 technology providers, 2 construccion companies, 6 universities, 7 research centres, etc.).

ODIN
Optimized electric Drivetrain by Integration

Project Information:
Duration: 1/7/12 + 36 months
Funded by: 7th Framework programme
Webpage: www.fp7-odin.eu

Coordinator:
Kerman Osoro
CIE Automotive
e-mail: kosoro@cieautomotive.com

Motivation and objectives

Demands on the e-powertrain to be both cost attractive and power efficient continue to motivate research and development. Highly integrated powertrains using high-speed electric motors continue to have a high potential to reduce cost, space and weight. Thus the goal of this project is to combine a gearbox with a high-speed electric motor and power electronics in a common housing with an integrated cooling/lubrication circuit to confirm this potential. The answer to reduce the cost of electric vehicles while ensuring performance and meeting quality standards is component integration from the very first design step.

Technical approach

The core concept of the project is the optimal integration of a high speed e-motor with a high speed gearbox in a single housing. The housing will furthermore include the necessary power electronics.
CIE Automotive contributes through a new housing concept taking into consideration the specific but possibly different needs of e-motor, gearbox and power electronics, and integrating an innovative single cooling circuit for the whole e-powertrain to use synergies, by, for example, using the same fluid for cooling and lubrication.
Cost-efficient mass-production compatible design is being considered for the single subcomponents and their integration.

Status / Achievements

1st loop prototypes single components being launched between November and December 2013 in order to start assembly and testing during Q1-Q2/14.

Partners

BOSCH, CIE Automotive, FUCHS, GKN Driveline, ISEA RWTHAACHEN, RENAULT, ROMAX TECHNOLOGY.

OpEneR

Optimal Energy Consumption and Recovery based on system network

Project Information:
Budget / Funding: 7.74 M€ / 4.4 M€
Duration: 36 months
Funded by: 7FP – STREP
Project Webpage: http://www.fp7-opener.eu

Coordinator:
Dr. Kosmas Knödler (Robert Bosch)
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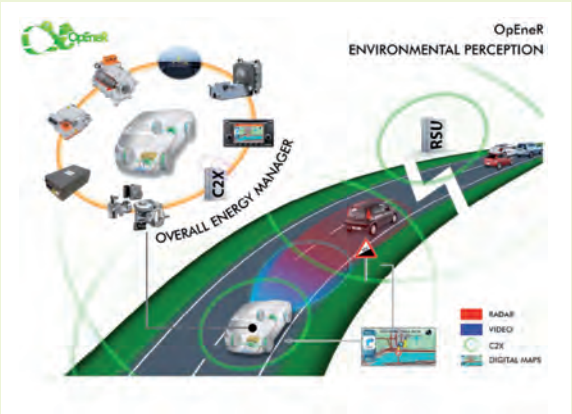
Spanish contact:
Ana Paul (CTAG)
e-mail: ana.paul@ctag.com

Motivation and objectives

Vehicle electrification will contribute significantly to the further reduction of vehicle fleet CO_2 emissions. However, the limited electric driving range, very high battery price, and long charging times of today's fully electric vehicles are major impediments to their widespread market acceptance. OpEneR will reduce the "range anxiety" that drivers of fully electric vehicles experience, through the realization of a longer, more consistent, predictable and clearly displayed remaining electric driving range, with the use of highly innovative controller software algorithms. These algorithms will merge data from a diverse range of on-board and off-board sources (existing and new) to provide timely and effective driver guidance through enhanced vehicle dashboard displays.



Technical approach

The OpEneR system will provide advanced and fully integrated driver support, based on a networked architecture comprising for example, vehicle, battery, e-machine, regenerative braking, adaptive cruise control, and 3D satellite navigation route data, as well as car-to-infrastructure and car-to-car (C2X) communication and enhanced haptic dashboard and head-up. Furthermore, a sophisticated and integrated vehicle stability controller with enhanced environmental sensing will improve safety.

Status / Achievements

OpEneR project has started in 2011. The final project goal is to demonstrate the benefits of OpEneR strategies in two fully operational electric vehicles tested under real world conditions.

Partners

Robert Bosch, Peugeot Citroën Automobiles, Robert Bosch Car Multimedia, AVL List, CTAG, Forschungszentrum Informatik an der Universität Karlsruhe.

OPTIBODY

Optimized Structural components and add-ons to improve passive safety in new Electric Light Trucks and Vans (ELTVs)

Project Information:
Budget / Funding: 2,951,859.00 € / 2,038,463.00 €
Duration: April/2011 - March/2014
Funded by: UE – FP7- Collaborative Project
Webpage: http://optibody.unizar.es

Coordinator:
Juan J. Alba
Universidad de Zaragoza
e-mail: jjalba@unizar.es

Motivation and objectives

OPTIBODY is a new concept of modular structural architecture for electric light trucks or vans (ELTV's) focusing on the improvement of passive safety.

Technical approach

OPTIBODY will develop a new concept of modular structural architecture for electric light trucks and vans implementing new concepts entirely acceptable by large manufacturers. It means that all the major European automotive industries will be able to take advantage of these new concepts that will be applicable to other kind of vehicles where electrification could lead to new structural architectures.
Thus, OPTIBODY, given the new distribution of internal components in EVs represents a unique opportunity to implement innovative solutions for passive safety in ELTVs.

Status / Achievements

The Project has just started (April 2011) so it is in the initial phase of analysing and compiling information.

Partners

Spain: UNIVERSIDAD DE ZARAGOZA, IDIADA, CENTRO ZARAGOZA, MONDRAGON AUTOMOCION. Italy: POLITECNICO DI TORINO, ITALDESIGN - GIUGIARO. Poland: PIMOT, AMZ-KUTNO, ZAKLAD KOMPOZYTOW, Sweden: SSAB.

OPTIVE

Research into control algorithms for the optimization of in-wheel motors

Project Information:
Budget / Funding: 0.5 M€
Duration: January/2010 - December/2011
Funded by: ADE
Webpage: www.cidaut.es

Coordinator:
Esteban Cañibano Álvarez
Fundación CIDAUT
e-mail: estcan@cidaut.es

Motivation and objectives

This project starts with the main aim of studying the new possibilities in control systems offered by in-wheel electric motors. This kind of traction system opens widely the vehicle active control strategies. Obtaining an independent distribution of traction torque on each wheel allows a quicker, more efficient and more stable variable dynamic performance of the vehicle. It also extends the working range of the vehicle into more critical situations. In the end, people and goods are transported in a safer way.
As a consequence, it is not only wished to ease the handling of the vehicle (enhancing its dynamic performance and active control) but also, the optimization of its confort, safety and energetic capacity, in order to have more efficient vehicles and with lower emissions and consumes.

Technical approach

In order to achieve this objective, the following scientific and technical objectives have been defined:

- Introduction of four in-wheel motors as a simplification of the traction system.
- Modelization of new control algorithms for independently wheel torque distribution.
- Extension of the ESP concept to the new traction system configuration.
- Implementation on a real prototype for the validation of main conclusion extracted in simulation.

Status / Achievements

The project has started this year, most of the time has been invested into studying the possibilities and new modelling approaches.
More concretely, a Direct Yaw Moment Control algorithm has been developed as an extended application of the current ESP systems. Due to the duality of the control of the braking and traction torques in each wheel, the new control system values the different strategies for each case and it applies them consequently both quickly and accurately.

Partners

Coordinator: Fundación CIDAUT (Spain).

POWER

Predictive Control Techniques for Efficient Management of Renewable Energy Micro-grids

Project Information:
Budget / Funding: 697,698 €
Duration: 01/2011 - 12/2013
Funded by: Spanish Ministry of Science and Innovation
Webpage: www.esi2.us.es/power

Coordinator:
Carlos Bordons
University of Seville
e-mail: bordons@esi.us.es

Motivation and objectives

The expected massive use of electric/plug-in hybrid cars will have a considerable impact on the electrical grid operation in the next years. The future scenario includes cars both as consumers and distributed generators, operating in a similar way as other distributed energy sources, such as Renewable Energy Sources (RES).
This project deals with the analysis, study and application of modeling, control and optimization strategies to achieve an efficient energy management in renewable energy micro-grids. Notice that electric/hybrid vehicles are of great interest to the project, since they can act as loads (drawing energy from the grid), as storage devices (storing energy in their batteries) and as generators (supplying stored energy when needed). One of the objectives of the project is the developmente of a hybrid vehicle using a fuel cell as a range extender.

Technical approach

The project will test the optimization algorithms for power control on a pilot-scale micro-grid that includes RES, energy storage (both electrical and hydrogen) and loads. One of the loads is a small fleet of electric and hybrid vehicles. The project will use Model Predictive Control (MPC) formulations for the optimal economic management of heterogeneous energy systems integrated in a micro-grid. Notice that hybrid vehicles are of great interest to the project, since they can act as loads (drawing energy from the grid), as storage devices (storing energy in their batteries) and as generators (supplying stored energy when needed). A hybrid car will be developed in the project framework. This vehicle will be powered by 4 PMS motors and the energy will be stored in Li-ion batteries, using a small fuel cell (only a few kW) as a range extender. The use of 4 in-wheel motors will provide high flexibility and will allow the improvement of the dynamics characteristics of the vehicle, such as stability and drivability.

Status / Achievements

The project has started this year and the main achievements up to now are related to modelling and control algorithms. Also the conceptual design of the car has been done. The mechanical design and the choice of the motors and battery have already been done. The simulated results that have been done up to now show that Model Predictive Control is the appropriate strategy for power management in micro-grids with several power sources, as it the case of the fuel cell hybrid vehicle.

Partners

University of Seville, University of Almería, University of Valladolid and CIEMAT, Spain.

POWER FLOW

Research on components and configurations of Redox batteries for energy storage systems

Project Information:
Budget / Funding: 1,000,000 € / 600,000 €
Duration: 03/2012 – 12/2013
Funded by: CDTI – IDI Project

Coordinator:
Beatriz Ruiz Castelló
JOFEMAR S.A.
e-mail: beatrizr@jofemar.com

Motivation and objectives

The aim of the project is to investigate and validate the potential of Redox Flow batteries, based on Zn⊠Br couple, and to determinate the main characteristics of their components, for using them in electric vehicles and electricity regulation. Some of the specific objectives are the following:

- To validate the behavior of Redox Zn/Br battery for high power applications.
- To determinate the possibility of having an energy storage system at a cost of 200 €/kWh.
- To obtain an energy storage system able to withstand 1.000 charge/discharge cycles at 60% DOD.
- To build an industrial prototype of such a battery electrochemistry of 1.5 kW of power and 1.5 kWh of energy storage capacity.
- To design an easy manufacturing and simple maintenance energy storage system, environmental friendly, with an energy efficiency around 75%.

Technical approach

Several aspects of the technology have been taken into account:

- Assessing nanotechnologies and diverse geometrical configurations for increasing the contact surface between the electrodes and the electrolytes, enhancing the electrochemical reaction kinetics.
- Adding different additives to the electrolytes to improve the behavior of the cells in terms of reducing Zn dendrite formation, retaining Br2 molecules in an efficient way and increasing electrolyte stability during rest periods.
- Studying new membranes and their correlation with electrolytes and electrodes to obtain high performance at high currents.
- Designing new hydraulic and control systems and methods to get efficient and easy operation and maintenance batteries, with minimum energy consumption for reducing operating costs.

Status / Achievements

Major advances have been met in the knowledge of materials for battery components and the processes to produce them, including electrodes, membranes and electrolytes. At this time, first series of tests are carried out in stacks according to the project objectives in order to understand the electrochemical behaviour of the Zn/Br system for electric vehicle applications and control algorithms are under development as well as improved housing configurations and materials for such application.

Partners

JOFEMAR S.A., Universidad de Córdoba (Grupo FQM-175), L´Urederra Centro Tecnológico, Instituto Tecnológico de la Energía (ITE) y ASCAMM Centro Tecnológico.

PRO-E-BIKE

Promoting electrical bikes and scooters for delivery of goods and passenger transport in urban areas

Project Information:
Budget / Funding: 1,282,453 € / 961,840 €
Duration: (04/2013-03/2016)
Funded by: Intelligent Energy Europe Programme of the European Union
Webpage: http://www.pro-e-bike.org/

Coordinator:
Matko Perović
Energy Institute Hrvoje Požar EIHP
e-mail: mperovic@eihp.hr

Contact information (ITENE): jleon@itene.com

Motivation and objectives

PRO-E-BIKE project promotes clean and energy efficient vehicles, electric bicycles and electric scooters (common name "E-bikes"), for delivery of goods and passenger transport among private and public bodies such as delivery companies, public administration and citizens in European urban areas as an alternative to "conventionally fossil fuelled" vehicles. The project actions are directed towards E-bike market uptake and promotion of policies that stimulate the usage of E-bikes in urban transport. Pilot projects among target groups (delivery companies and companies with their own delivery personnel, public administration, local authorities and citizens in selected urban areas) will not only help us to achieve these objectives, but as well, enable the demonstration of measurable effects in terms of CO_2 emission reduction and energy savings in urban transport.

Technical approach

The project involves:

- The development of at least 25 pilot actions in delivery services with the introduction of e-bikes for their daily activities.
- The development of action plans for 7 pilot cities regarding E-bikes utilization and incorporation of E-bikes in city transport strategies, including two info days in each pilot city.
- The design and development of a multilayer E -bike simulation tool for target groups. This tool will enable potential users to estimate costs and benefits that can result from introduction of E- bikes in their business. The tool will be presented in additional 50 delivery companies (beyond pilot project companies) in project countries.
- The creation of business models for E-bikes (for transport of passengers, goods transport and mixed transport).
- Reduction of GHG emissions up to 283 tCO_2/year, measured with saved petrol in delivery companies and public administration during the project pilot actions

Status / Achievements

The project started in April 2013 and the pilot companies and cities have been selected in the 7 countries involved in the project: Spain, Croatia, Sweden, Italy, Netherlands, Slovenia and Portugal. Cities such as Geneva, Valencia or Lisbon, as well as companies such as TNT and DHL have confirmed their participation in the pilot actions. Currently the framework for the evaluation and execution of pilot actions is being developed. In this regard, the following tasks are being developed: 1) State of the art of the use of e-bikes for urban freight transport: trends, policies and best practice examples; 2) Definition of the action plan to be implemented in pilot companies and cities.

Partners

EIHP; ITENE; POLIEDRA; Mobycon; Energikontoret Östra Götaland AB; ECF; Sinergija; Occam; Cicli Lombardo; IST Portugal.

PRT Miramón

Sistema de Transporte Rápido con vehículo guiado automático en el Parque de Miramón

Project Information:
Budget / Funding: 1.1 M€ (budget)
Duration: 3,5 years
Funded by: Innpacto. MICINN
Webpage: n/a

Coordinator:
María Izaguirre
NOVADAYS
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Motivation and objectives

Passed tendency in XXth Century has been massive extension and use of private vehicles using oil derivate. Presently, the greenhouse effect discovery has oriented much of the R&D towards electric vehicle development.
In relation to the massification of highways and normal roads, increase of number of cars has only driven our society to continuous traffic jams, and millions of working and leisure hours lost.
The objective of the project is reaching a sustainable mobility, with the minimum impact on environment through adopting new solutions based on present and future technologies (many of the ICT's ones). The project will create new technology and will perform pilot experiences in a specific place: Parque Científico y Tecnológico de Miramón, in San Sebastian.

Technical approach

Developing of a complete new autonomous car system for PRT model mobility.

Status / Achievements

On Going project.

Partners

TECNALIA, Novadays.

QUICK

QUICK

Project Information:
Budget / Funding: 1.28 M€
Duration: 2010 - 2012
Funded by: Private funding

Coordinator:
Santiago Cascante
ENDESA
e-mail: santiago.cascante@endesa.es

Motivation and objectives

Endesa, as an energy services provider, must offer the possibility of fast recharging process to its customers. For this reason, it is necessary to test, in a real environment, the available and developed technology to introduce fast charge in the distribution grid.
The project considers the installation of 14 fast charge points for electric vehicles distributed throughout ENDESA's main EV demonstration cities in Spain. The fast charge infrastructure considers:

- DC quick charge (RRB).
- DC quick charge with storage system integration (RRD).
- DC quick charge with bidirectionality V2G (RRBid).
- DC quick charge with inegration of RES (RRI).

Technical approach

Design and installation of the first living lab on Quick Charging Stations in a- real environment, demonstration project including DC quick and bi-directional charging systems based on CHAdeMO specifications to study the impact of fast charge in electric vehicles and the electric grid.

Status / Achievements

Installation of the first Quick charging station in Spain at a CEPSA gas station in Barcelona, in March 2011.

Partners

None.

RETROFIT

Retrofit Hybrid TMB

Project Information:
Duration: August/2010 - December/2011
Funded by: Nuclis Cooperatius Programme; ACC1Ó, Catalonia Government.

Coordinator:
Josep Maria Armengol
TMB
e-mail: jmarmengol@tmb.cat

Motivation and objectives

The motivation of this project is Improving the air quality in Barcelona in the Transport public converting the actual bus fleet.
The aim of this project is the conversion of diesel buses from the public transport company of Barcelona to become diesel-electric hybrids.

Technical approach

Develop a prototype of hybrid bus from a diesel one. The project consists in remove the gear box and installed electrical engines, a power control system and an energy storage system (based in Ultracaps). After homologation process the bus is running in 44 bus route in Barcelona.
With hybrids bus, there is a saving of 25-30% in consumption and the proportional part of local emissions (NOx and PM) and global warming (CO_2). Also we reduce the noise in 3 dBA and will be more comfortable the driving for driver and passengers because of the advantage that while standing in traffic lights the vehicle stops the diesel engine.

Status / Achievements

This conversion project will provide a fleet of 80 new retrofitted buses. This is a preliminary measure pending to mass-production of hybrid buses.

Partners

TMB; SIEMENS; EDAG; NOGE and IREC.

REVE
Wind Regulation through Electric Vehicles

Project Information:
Funding: 73,414 €
Duration: January/2010 - April/2010
Funded by: Plan Nacional I+D+i, Ministerio de Industria, Turismo y Comercio
Webpage: www.evwind.es

Coordinator:
Asociación Empresarial Eólica
e-mail: aeeolica@aeeolica.org

Motivation and objectives

The REVE project (Wind Regulation through Electric Vehicles) aims at performing a study thoroughly assessing the key technical challenges and the most relevant economic aspects in order to create a network infrastructure so that electric cars may act as energy storing facilities in the electric network while they are not circulating, thus contributing to an improvement of the load factor of the electric system as a whole.

Technical approach

To evaluate the technical challenges and the most important economic aspects to create a network infrastructure for bidirectional electrical vehicles. The electric vehicles can be used as electrical storage when they are parked; and as evacuation of wind energy while charging.

Status / Achievements

The results show that the integration of electric vehicles contributes to increase the amount of wind power generation that can be feed in the system.
The electric distribution grids are also capable to support the integration of the electric vehicles if suitable demand side management tools are applied.

Partners

CIRCE; IREC; CENER; ENDESA.

SIRVEAC

Electric vehicle charging system in closed area with versatile means of payment, accounting system and power connector

Project Information:
Budget / Funding: 901,291 €
Duration: 20-25 months
Funded by: CDTI - PID
Webpage: www.cdti.es

Coordinator:
Luis Cabrera
DESARROLLO INFORMÁTICO, S.A.
e-mail:lcabrera@dinsa.es

Motivation and objectives

The main objective of the project is to investigate new technologies for the development of an intelligent electric vehicle charging system, able to charge the batteries in a timely manner (cheaper or more available energy). It will also include a number of innovations in terms of payment possibilities, charging modes, versatility of connectors and charging management.

Technical approach

CHARGING SYSTEM ARCHITECTURE
Within the present project it is intended to research and develop the various subsystems that compose the intelligent electric vehicle charging. The final aim will be to apply this knowledge gained with the implementation and testing of two different prototypes for the final system, one focused on the domestic garages and another one with multipoint features and several sockets to be used in parkings and malls.
The charging system functionality can be divided into three individual units which altogether manage to deliver an efficient management of the reload:

- Recharge Point (RP).
- Local Manager (LM): responsible for managing energy flows that are distributed between the different charging points (to set a forecast of demand for the recharge points and measure the power available for electric vehicles connected to these points).
- Management Center (MC): will coordinate the proper operation of all local managers (to validate, with the different agents of the electrical system, that the different load forecasts provided by the LM can be accomplished).

Status / Achievements

Nowadays, the project has not been finished yet. The goals that the project seeks to achieve include:

- To obtain new knowledge in the field of Management Devices Electric Vehicle Charging.
- To develop a specific intelligent electronic device (Intelligent advanced load management system) that allows users to freely manage electric vehicle recharges.
- To develop new payment modes (including domestic electronic bills).
- To reduce maintenance costs of these devices and their installation costs.
- To ensure freedom of choice by each.

Partners

- DINSA, is the first ICT company certified by AENOR in supply and installation of energy efficient equipment, which includes consulting, systems monitoring and management, funding, grants and certifications.
- ORBIS TECNOLOGIA ELECTRICA is a company specialized in the design and manufacture of electrical equipment designed for management and energy efficiency. ORBIS has more than 60 years of experience.

smartCEM
Smart Connected ElectroMobility

Project Information:
Budget / Funding: 4.9 M€ (50% EC funding)
Duration: Jan 2012 – Dec 2014
Funded by: EC - CIP: Competitiveness and Innovation Programme
Webpage: www.smartcem-project.eu

Coordinator:
Fernando Zubillaga
MLC ITS Euskadi
e-mail: fzubillaga@mlcluster.com

Motivation and objectives

- Prove that user acceptance of EV can be increased by at least 15%.
- Evaluate how much transport efficiency can be optimised.
- Develop tools.
- Identify barriers and address all deployment elements.
- Support pan-European interoperability.
- Pave the way for wider acceptance of adopting electro mobility in all types of road transport (private cars, powered two-wheelers, public transport and urban freight).
- Integration of new schemes (e.g. EV sharing).

Technical approach

- To develop a common High Level Architecture for all pilot sites.
- To identify adaptation needed in different pilot sites that is compliant with the defined HLA and ensures interoperability across pilot sites.
- The following services to be implemented in 4 different pilot sites (Barcelona, Gipuzkoa – San Sebastián, Newcastle, Reggio Emilia):
  - EV navigation.
  - EV efficient driving.
  - EV trip management.
  - EV charging station management.
  - EV sharing management.

Status / Achievements

- Defined and agreed a common smartCEM technical approach.
- Indentified local adaptations needed to implement the different smartCEM services.
- Implementation Plan done.
- Operational Phase (Baseline) to start in September 2013.

Partners

Asociación Cluster de Movilidad y Logística de Euskadi MLC; Ertico; Ajuntament de Barcelona; Gipuzkoako Foru Aldundia Ayuntamiento de Donostia-San Sebastián; Citta di Reggio Emilia; Pluservice SRL; University of Newcastle Upon Tyne Unew; Deutsches Zentrum fuer Luft - und Raumfahrt EV DLR; Federation Internationale de L'automobile – Fia; Centro Ricerche Fiat SCPA; Reial Automòbil Club de Catalunya – RACC; Fundacion Tecnalia Research & Innovation; Teamnet International SA; Idiada Automotive Technology SA; Ennera Energy and Mobility; Compania del Tranvia de San Sebastian SA; Nec Europe Ltd; Robert Bosch GMBH; Gateshead College; Fundación Creafutur; Consorzio Interuniversitario per L'ottimizzazione e la Ricerca Operativa; Avid Innovation Limited; Affiliated Computer Services B.V.; PTV Planung Transport Verkehr AG; Fomento de San Sebastian; Universita Degli Studi di Modena e Reggio Emilia.

SmartCity

SmartCity

Project Information:
Budget / Funding: 31.9M € / 75%
Duration: 2009 - 2012
Funded by: CDTI (FEDER)
Webpage: http://www.smartcitymalaga.es/

Coordinator:
ENDESA
e-mail: oficina@smartcitymalaga.com

Cordinator of EV related project matters:
Eduardo Mascarell
e-mail: eduardo.mascarell@endesa.es

Motivation and objectives

SmartCity will prove key factors in Smart Energy and will contribute to the 20-20-20 objectives in 2020.
The project objective is to develop a demonstrator for the next generation grid for electricity distribution. Within this new Grid, customers and Distribution companies cooperate for the achievement of the energy challenge.
Include micro-generators and micro-storage in LV/MV grid in order to minimize power delivered thought the LV/MV feeders. Optimizing the usage of renewable energy sources.
Active Demand Response through acting in loads, and passive demand response through acting in consumer's habits.
As more stakeholders will be involved in the new grid, some new Advance Distribution Automation features will be tested.

Technical approach

The relevance of ICT technologies: Communications (Real-time IP network).
AMI (Advanced Meter Infrastructure): Smart meters (electricity, water and gas), Demand response, Smart buildings and homes and Smart and informed customers.
ADA (Advanced Distribution Automation): Real-time monitoring, Network failure and recovery and Network automation.
DER (Distributed Energy Resources): Electric vehicles, Energy storage and Distributed generation of renewable sources.

Status / Achievements

The Endesa Smartcity project win two awards at the Smart Metering Europe 2011 Conference in February 2011.
The Junta de Andalucia Counselor opened the Smartcity Monitoring and Control Center in March 2011.

Partners

ENDESA, SADIEL, IBM, ACCIONA, ORMAZABAL, ISOTROL, NEOMETRICS, TELVENT, INGETEAM, GREEN POWER.

SMART EV-VC

Smart Electric Vehicle Value Chains

Project Information:
Budget / Funding: 1,310 M€ / 0.996 M€
Duration: October 2012-September 2014
Funded by: EC FP7 / CSA
Webpage: www.smartev-vc.eu

Coordinator:
Dr. Gereon Meyer
VDI/VDE Innovation + Technik GmbH
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Spanish contact: María Luisa Soria (SERNAUTO)
e-mail: marialuisa.soria@sernauto.es

Motivation and objectives

Fully electric vehicles (FEV) have been in the spotlight for a while now with promises of being the "green" car of the future. However, the FEV presents us with many challenges. Stakeholders across the sectors of the complete value chain must now turn ideas into products and develop the related markets. The Smart EV-VC project aims to facilitate, support and initiate strategic discussions and consultation processes by sustaining and coordinating a FEV network for collaboration and communication.
The results of Smart EV-VC are expected to be a major contributor towards the success of the FEV. The insights gained during the project will enable every member of the value chain make the best decision towards bringing the future car into the market.

Technical approach

The Coordination Action Smart EV-VC is devoted towards developing, recommending and initiating a multitude of tangible measures supporting the adaptation of automotive value chain to the challenges presented by the fully electric vehicle. Smart EV-VC concentrates on the FEV "made in Europe" with a particular focus on ICT and smart systems as key enabling technologies.
Central project goals are community building and networking on the European and international level, support of the European Technology platforms EPoSS, ERTRAC and SmartGrids, supporting relevant European roadmapping activities and promoting innovative links in the European FEV value chain.

Status / Achievements

The aim of the first project phase is to assess the current status of the value chain and potential unique features of a FEV produced in Europe as well as strategic advice and recommendations on roadmap implementation and on measures for strengthening the European FEV value chain.

Partners

VDI/VDE-IT, Renault, Bosch, Siemens, ST Microelectronics, AVL List, VUB, SERNAUTO, IFEVS.

SMARTV2G
Smart Vehicle to Grid Interface

Project Information:
Budget / Funding: 3,274,370 € / 2,520,000 €
Duration: 06/2011 - 05/2014
Funded by: Collaborative project - FP7 [GC-ICT-2011.6.8]
Webpage: tbd

Coordinator:
Sixto Santonja Hernández
Instituto Tecnológico de la Energía
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Motivation and objectives

In a context of an obliged continuous optimisation of the energy consumption rates in developed societies, embedded systems and solutions can perform a significant role in the transition process towards a Sustainable Urban Life concept in European countries. One of the main and most promising technological areas that are expected to be able to contribute in a most relevant way to that overall target is the one constituted by the electric vehicles

Technical approach

These specific objectives have been defined:

- Develop a V2G system made up of a smart grid of charging stations.
- Define control systems architecture.
- Develop communication and information processing between EV and infrastructure
- Define specification of communication standards and interfaces/information processing standards.
- Ensure security in charging stations and identification.
- Test and validate the developed technology and systems.
- Disseminate project results and ensure scalability and compatibility.

Status / Achievements

The electric cars are expected to have a major impact in the auto industry given advantages in city pollution, less dependence on oil, and expected rise in gasoline prices.
In the European Union the 2020 strategy is fixed on a more clean and energy efficient vehicles. The technological challenges in this will be very important for the European industry to maintain his technological leadership.
The communication between the electric vehicles-EV and the GRID is one of the first issues to be solved in order to provide an efficient charging system for the EV. The aim of this project is to develop a smart charging infrastructure for the EV to ensure the integration of the vehicles in the grid and the use of renewable energies for charging the battery vehicles.

Partners

Instituto Técnológico de la Energía (Coordinator) (ES), Fraunhofer ESK (DE), Etrel (SL), CIT Development (ES), Sapienza Universita de Roma (IT), Tedhnomar (DE), Elektro Ljubljana (SL).

SOMABAT

Development of novel SOlid MAterials for high power Li polymer BATteries (SOMABAT). Recyclability of components

Project Information:
Budget / Funding: 5.04 M€ / 3.7 M€
Duration: 01/2011 - 12/2013
Funded by: Collaborative project - FP7
Webpage: WWW.SOMABAT.EU

Coordinator:
Mayte Gil-Agustí
Unidad Química Aplicada-
Instituto Tecnológico de la Energía (ITE)
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Motivation and objectives

SOMABAT aims to develop a more environmentally friendly, safer and better performing lithium polymer battery technology targeted for electric vehicle. The SOMABAT strategy is focused on novel breakthrough recyclable solid materials to be used as anode, cathode and polymer electrolyte, new alternatives to recycle the different components and a complete life cycle analysis of the battery.

Technical approach

To achieve the general objective SOMABAT project proposes:

- Development of synthetic and recyclable materials with controlled properties by new synthesis and processing methods.
- Development of a new battery management system according to the developed materials.
- Modelling of Li polymer cells behaviour.
- Integration and testing of the optimised materials in lithium polymer cells/battery.
- Recyclability of the battery components.
- Analyze the environmental impact and sustainability of the developed lithium polymer battery by a life cycle assessment.

Status / Achievements

The expected improvement of the battery sustainability and performance will facilitate the incorporation of electric vehicles to the market.

Partners

Instituto Tecnológico de la Energía (ES), Université de Liège (BE), Virtual Vehicle Competence Center (AT), Kyiv National University of Technologies and Design (UA), Institute of Chemistry Timisoara of Romanian Academy (RO), CleanCarb (LU), CSIC (ES), Recupyl (FR), Accurec (DE), Lithium Balance (DK), Cegasa Internacional (ES), Umicore (BE), Atos Origin (ES).

STABLE

Stable high-capacity lithium-Air Batteries with Long cycle life for Electric cars

Project Information:
Budget / Funding: 2,495,517.00 €
Duration: 1 September 2012- 31 August 2015
Funded by: European Union Seventh Framework Programme ([FP7/2007- 2013]) under grant agreement n° [314508].
Web page: http://www.fp7-stable.com/

Coordinator:
Prof. Qiuping Chen
POLITECNICO DI TORINO (POLITO)
e-mail: qiuping.chen@polito.it

Motivation and objectives

Electric car is considered as the most promising technical solution for automotive industries in 21st century since the use of electric energy not only slows down the petrol consumption but also contribute to reduce the CO_2 emission and toxic air pollutants. Li-ion battery is generally studied to meet the above demands. However, it is still not satisfactory for long distance use because of its limited energy density. Therefore Li-Air batteries have attracted world-wild attentions as an ideal alternative, because their outstanding energy density is extremely high compared to other rechargeable batteries. Objectives: The final aim is to obtain Li-air battery cells with specific capacity of 2,000 mAh/g and an improvement of cycle life to 100 – 150 cycles.

Technical approach

In this project, a multi disciplinary expert work team in materials synthesis and characterization, simulation and modeling, cells assembly and test will cooperate to carry out a joint research with the aim of developing innovative materials and technologies for EVs with the best performances and at the lowest possible cost in laboratory scale. This project contains innovations in the battery anode, battery cathode, battery electrolyte, simulation and modeling, assembly of battery cells and life cycle assessment etc.

Status / Achievements

The project just achieved its first year. Activities where focused on the elaboration of materials for the composition of the final device. New materials have been achieved as carbon mesoporous nanofibers for the air cathode or the use of new hydrophobic ionic liquid for the electrolyte. Cells have been assembled at the lab scale in order to determine the behaviour of the new material. Capacity of 2,575 mAh and energy 6,438 Wh, per gram of carbon as active material for the air cathode, have been reached for the first cyles of charge / discharge. So far, it has been possible to achieve a symmetrical charge / discharge of 20 cycles with ether based electrolyte. These results are encouraging for the final design of a commercial cell and its integration in a full electrical car.

Partners

(1) Politecnico Di Torino (Polito), Italy; (2) Leitat Technological Center, Spain; (3) L'urederra, Fundacion para el Desarrollo Tecnologico y Social (Lurederra), Spain; (4) Swerea Ivf Ab (Ivf) ,Sweden; (5) University College Cork, National University Of Ireland Cork (Ucc), Ireland; (6) Sakarya Universitesi (Sau), Turkey; (7) Celaya,Emparanza Y Galdos Internacional, S.A. (CEG), Spain; (8) ELAPHE, podjetje za razvoj in prodajo elektricnih vozil ter energijskih virovd.o.o (Elaphe), Slovenia.

SURTIDOR

Ultrafast DC charger with energy storage system

Project Information:
Budget / Funding: 3,5 M€/ 1,6 M€
Duration: 06/2010 - 12/2012
Funded by: Spanish Ministry of Industry, Tourism and Trade

Coordinator:
Enrique J. Dede
GH Electrotermia, S.A.
e-mail: edede@ghinduction.com

Motivation and objectives

The design, construction and evaluation of uni- and bidirectional off-board high power DC chargers composed by a base power station with charging satellites and supporting batteries for reducing the impact of the chargers to the grid as well as its balancing (B2G, Battery to Grid).
The analysis of the experimental impact to the grid of the high power chargers, unidirectional as well as bidirectional, the proposal of regulation standards for the integration of this type of chargers in the actual distribution infrastructure, the development of grid quality compensators and the experimental validation of the developed charging systems by the utilities as well as the automotive industry.

Technical approach

In the project high frequency, high power AC/DC uni-directional and bi-directional converters will be developed for the DC charging infrastructure, certified according to the CHAdeMO charging protocol and with/without external supporting batteries for reducing the grid impact of the chargers as well as balancing the grid by feeding energy back to the grid in the peak demand periods. High capacity batteries will be used as supporting batteries in order to reduce the power demand to the utility while charging and a specific BMS will be developed according to different charging scenarios. Advanced active filters will be also developed in the frame of the project in order to reduce the impact of the chargers to the grid.

Status / Achievements

Unidirectional chargers with a power level of 50kW functionally working, CHAdeMO, CCS and CE Certified are now in the commercialization phase.
The following activities have been completed:

- Study on the optimum technologies of the supporting batteries.
- Investigations on the impact to the grid of the fast high power uni- and bidirectional chargers with/out supporting batteries, as well as the design of optimal active filters for power quality improvements.

Currently searching for pilot projects to implement this technology.

Partners

GH ELECTROTERMIA (Coordinator), ENDESA, IBERDROLA, SAFT BATERIAS, HERGA, AUTOMOVILIDAD (ATISAE group), UNIVERSITY OVIEDO, ITE, CITCEA-UPC and subcontractors UNIVERSITY VALENCIA, POLYTECHNIC UNIVERSITY OF VALENCIA and IREC.

TECMUSA

Technologies for sustainable and accessible urban mobility

Project Information:
Budget / Funding: 1,5 M€
Duration: 2009 - 2012
Funded by: National Plan for Scientific Research and European Regional Development Fund (ERDF)
Webpage: http://www.insia-upm.es/ingles/tecmusa-project-16-fi.asp

Coordinator:
Francisco Aparicio Izquierdo
University Institute for Automobile Research (INSIA)
Technical University of Madrid (UPM)
e-mail: francisco.aparicio@upm.es

Motivation and objectives

Develop, test and integrate into platforms of electric and hybrid urban heavy duty vehicles:

- A set of technologies associated with these vehicles.
- Next-generation fuels.
- Electricity.
- Fleet management and information and communication systems.

To achieve urban transport of people and goods effective, energy efficiently, environmentally friendly and accessible to all users.

Technical approach

Actual technologies in urban transport are based on non-optimized platforms, with fosile-based powertrains, non accessible, and without ICT's usage. TECMUSA Project is developing solutions to improve all this terms, working on:

- Optimized structures.
- Advanced energy storage systems.
- Fast charge systems.
- Energy production and management optimization.
- Advanced fleet management systems in real time.
- Client Communication systems.

Status / Achievements

Currently, TECMUSA project has achieved part of its main goals, over all in terms concerned to structure optimization, advanced fleet management optimization and client communication. Terms about hybrid powertrain and energy storage are also being developed nowadays, and it is expected to have further results soon.

Partners

INSIA-UPM,CEI-UPM, GME-UPM, GPDS-UPM, GATV-UPM, GTI-UPM, GTH-UPM, RSC-UPM, RSTI-UPM, ALSA, EMT, CEMUSA, CASTROSUA, IVECO, AZKAR, FCC, SIEMENS, BOYACA, SEUT, GRUPOETRA, SAFT BATTERIES, CITET, AVIA INGENIERIA, ENDESA.

TRANVIA-H2

Hybrid tram development based on PEM Fuel Cells, batteries and supercapacitors

Project Information:
Budget / Funding: 1,000,000 €
Duration: 01/09 - 09/11
Funded by: PCTI Asturias

Coordinator:
Patricia Morala Argüello
Ferrocarriles Españoles de Vía Estrecha (FEVE)
e-mail: patricia.morala@feve.es

Motivation and objectives

The main objective of the project is the development of an innovative powertrain based on fuel cells, batteries and supercaps to drive a Hybrid Tram, that has been developed. This vehicle is going to be used as a facility for testing the system integration, and for models and methodologies validation. The railway vehicle fuelled by hydrogen is the first tram in Europe integrating these technologies. The vehicle is going to be used between Llovio and Ribadesella, in the North of Spain (Asturias). This development is part of a wide collaborative project which included other stages as the obtaining of hydrogen through biogas by the entity Biogas Fuel Cell, S.A. and the purification of previous hydrogen for its use in PEM fuel cells done by INCAR (National Institute of Carbon)

Technical approach

The selected vehicle is a series 3,400 made by SNCV. FEVE engaged CIDAUT for powertrain designing, control strategies definition, powertrain integration supervising, and starting up.
An energy model of the system was developed to size the different subsystems (fuel cells, batteries, supercaps, converters,...) and test several control strategies. Once main subsystems were selected, the instrumentation, actuators and the auxiliary systems were sized and chose. All these equipment allows the register, visualization and control of each parameter of the hybrid powertrain, allowing the test of different control strategies and configurations.
The physical integration was made using a 3D tool. Whole system integration and the starting up have been accomplished. Nowadays, the first tests of the vehicle are taking place on a siding branch line that belongs to FEVE in Pravia (Asturias).

Status / Achievements

The powertrain elements has been selected and integrated in the tram. Each system has been individually tested, being nowadays in the starting-up of the vehicle. It is planned to reach optimal working conditions during the next months. All the systems have been designed to accomplish current normative related to hydrogen and railway sector.
Tram's control strategies and control systems have been developed, paying special attention to the behaviour during transitory states. The system has been designed so the supercaps controls the bus voltage, the batteries helps the supercaps during power peaks (accelerating and braking), and the Fuel Cells, working in quasi steady state conditions, maintain the state of charge of the batteries and supply all the energy needed by the tram.

Partners

Biogas Fuel Cell, S.A.
INCAR (National Institute of Carbon).

T-TRANS

Enhancing the transfer of Intelligent Transportation System innovations to the market

Project Information:
Budget / Funding: 1,706,578.80 € / 1,499,504 €
Duration: September 2012-November 2014
Funded by: EC FP7 / CSA
Webpage: www.ttransnetwork.eu

Coordinator:
Xavier Leal
Universitat Autònoma de Barcelona
e-mail: xavier.leal@uab.es

Motivation and objectives

T-TRANS aims at providing information on innovation mechanisms for the ITS, facilitating the transfer of related innovative products and services to the market.
The project involves all stakeholders of the transport and ITS innovation chain: Universities, R&D and technology centres, enterprises of any size, regional clusters, public authorities and policy makers, venture capital and other investors, with special focus on SMEs.
The project addresses the difficulty of transferring to market developing technologies with a significant potential for improvement, both in terms of efficiency and costs, once they could be commercialised.

Technical approach

The starting point is a comprehensive analysis of the transport and ITS innovation chains, identifying in four specific case studies, the stages of technology development and time to market, the risk profile and the funding sources and gaps. Moreover, the evaluation of the market commercialization of research will be performed with a holistic approach that includes the mapping of instruments that support commercialization of research and technologies, the identification of the market drivers for transport innovation and of the channels and options for the commercialization of research.

Status / Achievements

Project results will contribute to fostering the development and deployment of new technologies in ITS development areas related to the four selected case studies. One of them is specifically devoted to Smart grid: connection, charging and storage of energy.
Finally, an ITS innovation network will be established, initially with three G-local Communities of Interest to Market (CIMs) that will be implemented in the EU regions of Central Macedonia (Greece), Galicia (Spain) and Latvia, thus setting the basis for the European ITS e-innovation network.

Partners

UAB, LGI Consulting, Atos Research, KEMA, SERNAUTO (Mª Luisa Soria – marialuisa.soria@sernauto.es), Fraunhofer CML, UNITS, Intelspace, TTI.

UNPLUGGED

Wireless charging for Electric Vehicles

Project Information:
Budget / Funding: 2.3 M€
Duration: October 2012 – March 2015
Funded by: EU (7FP)
Webpage: http://www.unplugged-project.eu

Coordinator:
Lourdes García Duarte
ENDESA, S.A.
e-mail: lourdes.garcia@endesa.es

Motivation and objectives

'Unplugged' is an EU initiative, launched within the activities of the Seventh Framework Programme for Research and Technological Development (7PM). The 'Unplugged' consortium involves 17 partners, including private firms, European research centres and universities, along with contributions from cities such as Barcelona and Florence. 'Unplugged' has a 2.3 million euro budget and is scheduled to run for two-and-a-half years.
Endesa will lead the working group that will build the first wireless fast charging station in the world. The same working group will also devise the integration between recharging station and in-vehicle equipment together with Circe Foundation, a Zaragoza-based research centre. Meanwhile, Enel will also develop and install a system for the operation and control of the charging station.

Technical approach

Unplugged will develop technology enabling more or less automated static and en-route charging of electric vehicles in an urban environment. The technology will be interoperable between different types of vehicles. The aim is to have a flexible, easy to use and interoperable system able to work with different vehicles, maintaining a high power transfer efficiency.

Status / Achievements

The project started in October 2012 and current status is according to the schedule expected so there are some deliverables under official revision of UE.

Partners

ENDESA, S.A.; Fundación CIRCE; FKA; ENIDE; HELLA; VOLVO TECHNOLOGIES.
Centro Ricerche Fiat ; ENEL DISTRIBUZIONE; BAE SYSTEMS; IDIADA; Transport for London.
Transport Research Laboratory; Commissariat à l'Energie Atomique; Vrije Universiteit Brussel.
Politecnico di Torino; CONTINENTAL Automotive GmbH ; Università degli Studi di Firenze.

URBAN CAR

Generation of a concept car for urban use of light weight and oriented to the user's needs and their preferences

Project Information:
Duration: 07/2008 - 06/2010
Funded by: IMPIVA (FEDER funds) – R+D Cooperation Project
Webpage: http://automocion.ibv.org/index.php/es/proyecto/show_proyect/3/81

Coordinator:
José Solaz
Instituto de Biomecánica de Valencia
e-mail: jose.solaz@ibv.upv.es

Motivation and objectives

This R+D project address to the need for a new vehicle concept that reduces the levels of contamination and saturation of space in our cities by adapting to current needs of users, emerging technologies and new environments.
The project aims to generate a new concept vehicle for urban environments with low weight and low power consumption, especially oriented to the needs of older users. This objective arises from the need reflected in the national and European platforms for the optimization of passenger vehicles with the aim of reducing pollution levels and saturation of vehicles in cities.

Technical approach

IBV used the following methodologies for the project development:

- User panels.
- Repertory grid technics.
- Context maping.
- Quantitative study.

Status / Achievements

The project is finished and these are the achieved objectives:

- There is a complete study of user needs (space, usability, comfort, ...) and their preferences (eg sense of security, modern aesthetics, money that would be willing to pay...).
- There is a concept vehicle with the design philosophy for all, in a way that all users are equally benefited, once it has become accessible and responsive to their needs in terms of usability, comfort, easy access and economic viability.
- The city car concept obtained suits the characteristics of the city such as reduction of spaces.
- Knowledge about the use of new plastic materials to replace the metal, reducing weight and maintaining levels of safety, comfort and usability.
- Knowledge about weight reduction and redesign of mechanical components required in this new urban vehicle.

Partners

Centro de Investigación de Tecnología de Vehículos (CITV).
Departamento de Ingeniería Electrónica (DIEO).
Instituto de Biomecánica de Valencia (IBV).
Instituto Tecnológico del Plástico (AIMPLAS).

urbóTICa
Development and planning of new models of sustainable urban mobility by means of the application of Information and Communication Technologies

Project Information:
Budget / Funding: 1,957,290.59 € / 675,921 €
Duration: 09/2008 – 08/2011
Funded by: Ministerio de Fomento - Acción Estratégica en Energía y Cambio Climático

Coordinator:
Rufino Javier Hernández Minguillón
Alonso Hermanos & Asociados Arquitectos, S.L.
e-mail: rufinojavier.hernandez@ahasociados.com

Motivation and objectives

Transport and mobility are the lifeblood of the cities. The nature and the design of the urban environment determine the requirements of mobility and transport infrastructures. There is a tight bond between placing and types of systems and the means to use them. At this time, in Europe (EU-15) the transport sector is the second main final consumer of energy and the third source of CO_2 emissions. In order to generate an including urban society, such mobility and transport must be easy, reliable, safe, fast and accessible for all inhabitants and sectors of the society. Subsequently, multidisciplinary projects to study the function and integration of factors that affect current cities must me considered, intended for developing solutions to improve systems. Between such solutions, ICTs could be considered.
The objective is to develop a multidisciplinary analysis system that allows the study of new sustainable urban mobility models based on the use of information and communication technologies (domotics, telecommunications, information systems, logistic management) in order to optimize transport infrastructures and services in cities.

Technical approach

Activities are divided regarding the several topics that affect the urban mobility and transport, with a strength relation with the main working area of each partner, forming Work Packages (WP): Telecommunication, Geographic information systems, Simulation and optimization, Urban and architectonic planning, logistic and urban distribution, new transport systems, intermodality. Correspondingly, there will be Focus Areas (FA) that correspond with impacts that are related transversally with WPs: Urban management and maintenance, Energetic efficiency, Environmental impact, Quality of life (Comfort, Security, Health) Economic feasibility.

Status / Achievements

- Software applications that consider several aspects that play a role in the design of sustainable urban mobility models and that allow the information management according the required detail level and the specific geographic scale.
- Systems based on ICTs for evaluating urban designs / urban intervention, in both existing urban environments and new urban projects, that allow to predict their social, energetic, environmental and economic impacts.
- Actual intervention proposals in the field of urban transport of people, goods and wastes, which were adapted to local requirements and consider current regulations and standards.

Partners

AH Arquitectos, Tecnalia Research & Innovation, Coordinadora Española de Polígonos Empresariales, Universidad Pública de Navarra, Ingeniería Domótica, Atlas Forwarding, Transportes AZKAR, IPG Araba, Desarrollo Sostenible.

V2M
Vehicle2Microgrid

Project Information:
Budget / Funding: 500k €
Duration: 2010 - 2013
Funded by: ENDESA-NOVARE

Coordinator:
Narcís Vidal
ENDESA, S.A.
narcis.vidal@endesa.es

Motivation and objectives

To be able to control the energy demand making use of the great potential of energy storage in EV's is a major motivation for the development of the necessary technology that allows for this process.
The short term objectives of V2M are:

- Set up the possibility of making use of the distributed storage that EVs allow for.
- Make use of this storage capacity to emulate energy storage within the electric grid.

In addition, the long term objectives are:

- To manage EV loads/unloads in a coordinated fashion and according to limitations and set points established by the service operator, the DSO or the aggregator.
- Evaluate the impact of massive introduction of EVs in the distribution grid.

Technical approach

V2M will develop and validate a fast charging station able to perform bidirectional energy transfers from the electric vehicle electric grid, i.e. V2G. The scope of the project includes the development of the V2G technology and its integration in Endesa's DC- CHAdeMO fast charge infrastructure. The project will be divided into two parts: a short term set of activities that include the development the V2G prototype, and a long term set of activities in which the impact of a massive rollout of EVs will be evaluated.

Partners

Endesa, CITCEA-UPC, IREC, Katholeike Universiteit Leuven.

VELEX
Exclusive Electric Vehicle

Project Information:
Budget : 1,563,864 €
Duration: (07/2012-08/2014)
Funded by: (CDTI – R&D individual project)
Webpage: http://www.hidronew.com/eng/

Coordinator:
Miguel Ángel Carrero
JOFEMAR, S.A.
e-mail: miguelc@jofemar.com

Motivation and objectives

The purpose of the VELEX project is to develop a smart electric car with different energy efficiency strategies for electric vehicles.

Technical approach

The proposed solution is a full electric car with more than 200 km autonomy and exclusive design. The new car will be able to be personalized by the customer.
Autonomy is a key factor in electrical vehicles and the car will be a V2G interface.

Status / Achievements

Technical activities in progress are the following:

- Conceptual design of the electric car.
- Analysis of material and lightweight of car structure.
- Development of an active Battery Management System with long autonomy.
- Design of flexible production strategies in order to manufacture personalised cars.

Partners

JOFEMAR.

VELIV

Design and development of a three-wheeler, electric, light, innovative and versatile

Project Information:
Budget / Funding: 0.3 M€
Duration: September/2010 - June/2011
Funded by: CIDAUT
Webpage: www.cidaut.es

Coordinator:
Esteban Cañibano Álvarez
Fundación CIDAUT
e-mail: estcan@cidaut.es

Motivation and objectives

The project was originated with the final aim of designing and developing a vehicle to cover several detected needs in the market.
Due to the high price of similar vehicles already on sale, the idea of a new concept of three-wheel vehicle that enhance notably its competitors not only talking about performance, but also about the new possibilities that this vehicle offers, such as the different driving modes or the loads distribution.
The origin of this concept is the need of this type of vehicles because they are becoming a more and more attractive mean of transport, both for leisure time and as an agile transport. This is improved if it is complemented with an electric assisted pedal system (composed of an electric brushless motor and a Lithium-ion battery). It has been designed to be used massively due to its innovative ideas, ease to use (designed for all types of users) and its technical characteristics including an attractive price.

Technical approach

In order to achieve this objective, the following scientific and technical objectives have been defined:

- Design of different configurations of use and weight distribution.
- Allow different drive modes (comfort and sport), completely configurable by the driver and during its use. This is reached due to the simplification of the inclination mechanism included in this design.
- Standardization of several of the used components.
- Reduce notably the price of existing similar cycles.

For all the reasons previously commented, this design covers in an integrated way every concept mentioned before, becoming the most complete and verstile operative three wheeler with few steps to reach the global market.

Status / Achievements

The design is fully completed and the prototype is being manufactured. Shortly, simulation results are going to be experimentally validated, just as a forward step into the merchandising of this concept of new vehicles.

Partners

Coordinator: Fundación CIDAUT (Spain).

VERDE

R&D in Technologies Applied for Electric Vehicles in Spain

Project Information:
Budget / Funding: 34,15 M€ / 49.34%
Duration: 12/2009 - 12/2012
Funded by: CDTI (Science & Innovation Ministry)
Webpage: http://cenitverde.es/

Coordinator:
Santi Castellà Daga
Centro Técnico de SEAT, S.A.
e-mail: santi.castella@seat.es

Motivation and objectives

The aim of the project VERDE is to research and develop technologies which allow the production and commercialisation of electric vehicles in Spain.
VERDE is an applied research project to develop new technologies, organised with a solid leadership, but also cooperative and based on the mutual trust between partners, which are convinced of being part of a common project. VERDE must be the driving force of future individual and cooperative projects to introduce the new developed technologies in the next generations of vehicles. The accomplishment of these objectives would allow Spain to reduce its energy dependency from the oil, to reduce the CO_2 emissions in the transport sector and to favour the penetration of renewable energy as established in the UE energy policy for 2020, and, last but not least, to guarantee the future of the industrial sector and the automotive R&D in the country.

Technical approach

Introducing electric vehicles in our societies is a complex task which involves many agents beyond the automotive sector. Therefore, project VERDE was divided in seven different work packages, and each of them focuses on concrete aspects that must be achieved, in order to convert the electric vehicle in a reality on our roads.
First work package studies different electromechanical architectures for plug-in-hybrid (PHEV) and electric vehicles (EV), in order to achieve the most energy efficient solutions for each type of vehicle and driving use. Second work package concentrates on the batteries for electric vehicles. Third work package develops complete electric systems for the vehicle traction, including motors, generators, inverters and electronic control. Forth work package designs integrated bidirectional converters for batteries to allow V2G services. Fifth work package studies local charging infrastructure systems and communication between vehicles and the electric grid. Sixth work package analyses the integration of the electrical vehicle through the management of smartgrids. Finally, seventh work package integrates and validates the developed technologies in a physical demonstrator.

Status / Achievements

After defining the requirements of each system the design of components and energy efficiency algorithms is currently being performed. First studies regarding the architecture for recharging management operation, simulations of loading in the Spanish grid with massive penetration of PHEV/EV according to price signals for final user, and environmental impact of EVs connection to the electrical grid and integration with renewable energies have also been carried out.

Partners

Companies: SEAT, Cegasa, Siemens, Lear, Cobra, Endesa, Iberdrola, AIA, Circutor, Ficosa, Green Power, Infranor, Mapro, Red Eléctrica España, Rovalma and Técnicas Reunidas.
Public and Private Research Centres: CTM, AICIA, ASCAMM, CIDETEC, CIRCE, CNM del CSIC, IIC, IIT, IREC, Leitat, Tecnalia, Universitat Politècnica de Catalunya (UPC) and Universidad Carlos III.

VICTORIA

Vehicle Initiative Consortium for Transport Operation & Road Inductive Applications

Project Information:
Budget / Funding: 3,774,935 €
Duration: July 2013 - December2014
Funded by: CDTI

Coordinator:
Lourdes Garcia Duarte
ENDESA, S.A.
e-mail: lourdes.garcia@endesa.es

Motivation and objectives

Endesa jointly with a consortium of five Spanish companies as well as a 3 research centres will launch in September 2013 the iniciative VICTORIA: a Project with a budget of 4 millions € and a duration of 16 months. The objective of VICTORIA project is to develop the first dynamic wireless charging EV lane in Spain. This new technology allows to charge an electric vehicle without connect any wire.
Malaga City will become the real living lab of the project. The vehicle used will be a full electric bus that currently coverts the line 16 of the Andalusian city. Thus, Malaga will become the first Spanish city with sustainable electro mobility in its urban public transport.
For the launch of VICTORIA, provides for the modification of a 100% electric bus equipped with a new triple recharging system, which allows not only recharge in the garages with a conductive connector overnight, also there will be partial recharges along the way using static inductive charging stations installed at the bus stops as well as a dynamic inductive charging lane. These partial recharges used to have an energy supplement and increased bus usage time compared to a conventional electric bus that is recharged only in garages at the end of the day, thus substantially improving profitability and efficiency. Furthermore, the inductive technology can reduce the volume and weight of the batteries in the buses decreasing their cost compared to an electric conventional charging system.
This innovative triple system with fully charge mode will be pioneer in the world and is also the first implementation of inductive EV charging on a real urban city in Spain, well connected to the electricity distribution network and sharing with thousands of real customers.

Technical approach

It will design, fabricate, assemble and launch an induction charging system for a bus length of 5.3 m. It provides the possibility of using supercapacitors to improve the electrical performance of the assembly, reducing stress and increasing battery life.
The system will be able to charge according to three modes:

- Fast conductive charging by protocol CHAdeMo.
- On route static inductive charge.
- On route dynamic inductive charge.

Status / Achievements

The project was launched officially in September 19th in Malaga City. Currently partners are working on the specifications of the systems.

Partners

ENDESA, S.A.; ENDESA DISTRIBUCION; CONACON; EMT; ISOTROL; MANSEL.

VOLTA BCN

Electric commuting motorbike

Project Information:
Budget / Funding: 1,5M€ / 0,9M€
Duration: 24 months
Funded by: ACCIO + Private
Webpage: www.voltamotorbikes.com

Coordinator:
Marc Barceló
Volta Motorbikes
e-mail: mbarcelo@volta-motorbikes.com

Motivation and objectives

Volta Motorbikes is a young company that believes in electric motorcycles as a transportation solution for the immediate future. Our mission and goal is to provide solutions to help reduce pollution and contamination in big cities, providing clean, efficient, reliable and affordable inner-city transportation.
Nevertheless, Volta Motorbikes believes that ecologic doesn't have to be synonymous of boring, lain or like motorcyclists say, "being decaf". In fact, this company is all about passion for design, performance, good sensations and emotions, all being reflected throughout its products.
Volta Motorbikes has developed its first project: the Volta BCN. The Volta BCN combines design, a sporty feel, innovation and sustainability all in one. This goes to show that a practical and sustainable vehicle can also be dynamic, while boasting an urban image and high performance. The Volta BCN is different from other urban electric motorbikes, as it combines technology, design and a sporty feel, to afford users the opportunity to experience motor passion while also being respectful of the environment.

Technical approach

Volta has developed a Battery Back with 3Kwh lithium-polymer cells. Inside this battery pack we can find not only the battery with his BMS , also the motor controller and the Vehicle Management Unit with his diagnosis system (both designed by Volta) , the DC/DC converter to 12V. This configuration has been chosen because it ensures that all components with high voltage are perfectly closed inside a safety box. A diagnostic tool allows us to find any failure inside the Battery Pack by connecting to a USB port placed outside the pack. With a full battery recharge cost of €0.45, this bike can recharge completely in just two hours when plugged into a 220-V household socket or at any public charging point. The Volta BCN has a range of approximately 70 kilometers. After 1,500 charging cycles, which is the equivalent of five years of daily recharges, the battery still has 80 % of its initial capacity.
One thing that we must point out about the Volta BCN is the quality of its components, as all of its parts are supplied by prestigious brands in the sector.
The motorbike comes with a trunk with capacity for a full-face helmet, as well as a mobile phone charger. Moreover, it includes wireless technology to connect the users Smartphone with his motorbike (with the Vehicle Management Unit), offering wide range of applications, such as programming time and recharge time, power setting limits and eco mode driving, give you advice about your driving style in order to save energy, among many others.

Status / Achievements

This motorbike, designed entirely in Barcelona, has received the name of the Catalan capital thanks to an agreement with the City Council, which hopes to display the city's aspiration to become a European benchmark in sustainable mobility and environmental respect.
After months of work and perseverance, the Volta Motorbikes project has now come to fruition and is about to begin the production phase, when funding is found.

XeV
Design and development of an electric vehicle driveline, chassis and suspension with integrated active control functionality for improved active safety

Project Information:
Budget / Funding: 1,506,256 € / 704,216.62 € (loan)
Duration: 01/2011 - 01/2013
Funded by: CDTI – IBEROEKA Program

Coordinator:
Jonathan Webb
IDIADA Automotive Technology
e-mail: jwebb@idiada.com

Motivation and objectives

The project consists in electrifying a pick-up including the following developments: (1) Complete redesign of the chassis frame meant to integrate optimally the batteries; (2) Fully Electric propulsion system of at least 1 motor per axle; (3) Newly developed suspensions adapted to the new frame and driveline; (4) Active torque distribution between front and rear axles meant to provide optimum traction in a wide range of circumstances; (5) Regenerative Braking system; (6) Semi-active damping; (7) Design of a complete ECU for the control of the propulsion system and integrating the above three control systems; (8) Complete electrical architecture.
The vehicle will present high level performances (enhanced traction capacities, dynamics response, comfort, NVH, braking) as well as a high level of active safety. New testing protocols and methodologies linked to electric vehicles and their components and systems will be defined.

Technical approach

The technical approach of IDIADA consists in designing and developing the following: (1) Electric propulsion system; (2)Front and Rear suspension adapted to the new driveline and chassis frame; (3) Regenerative Braking algorithm; (4) Front/Rear Torque distribution algorithm; (5) ECU unit for the powertrain commands and the integration of the electronic control systems which will be developed. A final prototype vehicle will be assembled and used for calibration activities and tuning work. Methods for designing and validating control systems and electrical drivelines will be developed during the project.

Status / Achievements

Selection of a target vehicle/State of the art studies/ Compiling of potential suppliers for the propulsion system (motors, batteries, invertors, chargers,...) and their technologies / Initial specifications of the vehicle targets and its systems, which will serve the design / development activities.

Partners

Mexico: Metalsa S.A. de C.V.; ITESM (Instituto Tecnológico y de Estudios Superiores de Monterrey Campus – Mexico); CIATEQ A.C. Centro de Tecnología Avanzada (Mexico).
Spain: IDIADA.

Z2A
Zem2All

Project Information:
Budget / Funding: 60 M€ / TBD
Duration: 2011 - 2014
Funded by: CDTI/ NEDO

Coordinator:
MITSUBISHI Corporation/ENDESA SA

Endesa Coordinator:
Eduardo Mascarell
e-mail: eduardo.mascarell@endesa.es

Motivation and objectives

The opportunity this project presents is to take advantage of the first real experience with a massive EV test in order to manage the energy and the grid infrastructures efficiently through the Zem2All solution. This project leverages and enhances the synergies created between the intelligent infrastructure and electric mobility within Smart City Malaga and seizes the opportunities of collaboration with major companies in the automotive sector such as Mithsubishi.
The objective of Z2A is to implement a global solution in e-mobility to set business in Spain, Europe and Latin America by deploying new technologies that could allow us to offer complete services to the customers.

Technical approach

The project encompasses the introduction of a fleet of 200 electric vehicles, and the development and integration of the needed infrastructure technologies (220 normal charging points and 16 points quick recharge), communications, network optimization energy distribution and user interaction. The project will thus develop a single framework of interaction in which all stakeholders of the electric mobility (vehicles, users, council, citizens, charging points, network distribution, etc.) will be able to communicate and operate.

Status / Achievements

Proposal already submitted to CDTI.

Partners

ENDESA, MITSUBISHI, HITACHI, TELEFÓNICA, SADIEL.

ZEM2ALL

ZEM2ALL

Project Information:
Budget / Funding: 45 M€
Duration: Jan. 2011 – Dec. 2015
Funded by: CDTI and NEDO (JSIP Program)
Webpage:www.zem2all.com

Coordinator:
Eduardo Mascarell Gurumeta
ENDESA, S.A.
e-mail: eduardo.mascarell@endesa.es

Motivation and objectives

The citizens of Malaga, both individuals and companies, will be made available electric cars and recharging infrastructure that will enable them be early adopters of electric mobility and enjoy its benefits and services in a massive demonstration project. The use of electric cars in Malaga will reveal the impact of their use in depth and provide information and experiences that will indicate the requirements for a large-scale deployment of electric vehicles in society.

Technical approach

The project has developed the deployment of 229 recharging points: 200 conventional points in homes or businesses of users attached to the project; 23 fast charging stations and another 6 bidirectional charging posts. Malaga has the largest fast charging points network of Spain: 23 posts from Mitsubishi Heavy Industries and Hitachi in nine locations, which allow to charge up to 80% of the vehicle's battery in less than half an hour. 6 Endesa´s bidirectional chargers are also installed in the Royal Tobacco Factory, which is the largest V2G (vehicle to grid) experience worldwide. These points allow the car to both take power from the grid and also to return energy to the electrical system at peak demand moments or under other specific needs. The overall charging infrastructure is connected to the Control Center.
This interconnection of points will also result in real-time useful information on aspects that will make it easier and more efficient to get around the city, such as the location of the nearest available fast charging point, or the best way to reach it. In addition, applications will be implemented to allow to manage and receive information about the car and its load from a mobile phone.
The new ZEM2ALL center, located in one of the Royal Tobacco Factory of Malaga´s buildings, will serve as a real test center for the operation of contaminants emission-free electric mobility. Through this initiative, the impact and resources management of electric mobility in the city of the future will be made known with information ranging from the use of cars, their recharging or the services that may be provided, to the impact on the cities´ energy management. To this end, the city of Malaga was chosen given its worldwide pioneering position in smart city management through its five years experience in the SmartCity Malaga, led by Endesa.

Status / Achievements

The recharging infrastructure, ICT platforms and associated services have been already deployed. The electric vehicles have been already provided to the final users, who are using them, and the demonstration is going ahead. Data acquisition and treatment is being done.

Partners

ENDESA, TELEFÓNICA, AYESA, MITSUBISHI, HITACHI.

ZeEUS
Zero Emission bUs Systems

Project Information:
Budget / Funding: 22 M€ / 13 M€
Duration: expected to start December 2013
Funded by: European Comission (FP7)

Coordinator:
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Motivation and objectives

Electrification of the public transport is a raising trend in Europe, and electric buses are expected to enter markets in near future as one of the most interesting options for overtaking urban environmental challenging targets. Electrification is driven by both economic and political reasons. However, the technology is not yet fully matured and ready for wide commercialisation, and as the Call text correctly states, indeed a large demonstration project will facilitate the market take up of electric buses in Europe. Furthermore, as unambiguous and extensive information about overall effects of electrified bus systems and related needs for changes on infrastructure does not exist today, UITP sees that its objectives perfectly match those of the call, so decided to build a consortium of partners, who were already considering their actions along this theme, and to collectively design demonstration project ZeEUS "Zero-Emission Urban Bus Systems". The objective of ZeEUS is to demonstrate the economic, environmental and societal feasibility of electric urban bus systems. This objective will be achieved by means of different demonstrators, spread around European cities that, combining innovative technologies for electric vehicles and infrastructure, will show the capability of electric bus systems to fulfill the mobility needs of citizens in urban environment.
ZeEUS project covers the most relevant state-of-art electric bus technology options and entertains different charging system and grid interaction types, as well as several different usage conditions including both urban structure, geography and climate. Full electric battery-based busses will be demonstrated in Barcelona, Bonn, Muenster, Plzen and Rome. In the Barcelona case the busses are slow-charged overnight, which imposes less demand on grid connection, but requires high battery capacity on-board. On Barcelona Endesa will purchase and install four charging stations, will monitor energy prices, energy sources, while parking the bus departure time of buses and load current in order to study a smart system for managing the loading process, will monitor the impact on the quality of the network of charging different events.

Partners

ENDESA, S.A.; UITP; TMB; ATAC; SKODA; VBC; VDV; UTP.

Directory of products/technologies

Energy storage technologies, ancillaries and management systems

EV ENERGY MANAGEMENT SYSTEM

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Technological description

Energy storage system for electric vehicles —especially lightweight— based on a rack that can integrate different modules, dimensions, geometry and standard connection system, regardless of the principle of energy storage.
The system has a management subsystem (Rack Management System) that identifies the type and number of modules and automatically adjusts the power electronics and vehicle settings to that particular integrated module configuration. It is a system that allows "plug and play" for any storage module that meets minimum functional requirements based on a standard. In addition to the inherent requirements of industrial design (geometry, structure...) the modules must have an electronic record with information on their technical characteristics and the historical original of usability.

Status

The technology is still pending to be validated in a 'proof of concept' prototype.

Applications

EV Energy Management.

Potential cooperation partners / Customers

- EV Fleet Managers.
- EV Manufacturers.
- EV End users.

Advanced Battery for Electric Vehicles in CEGASA

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Technological description

- Development and manufacturing of lithium ion cell and battery packs.
- Development of Green Cell Pouch type cells based on aqueous processing for electrodes (No use of NMP).
- Modular system design for battery packs allowing quick and easy integration into a wide variety of applications.

Status

Products in development: Cells and modules of lithium-ion for transportation.

Applications

- Transportation: Electric Vehicles, Handling vehicles, etc.
- Stationary Applications.

Potential cooperation partners / Customers

IK4-CIDETEC / SEAT.

High power and energy density supercapacitor standard modules

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Technological description

The standard module developed by CEIT has been optimized in terms of stored energy and power density taking into account also the cost of the auxiliary components in order to keep the final cost to a minimum. It's main characteristics are the following:

- High power and energy density: provided by the use of the best supercapacitors available in the market in terms of capacitance and life cycle.
- Re-configurable: Each standard module is equipped with its own intelligence, so it can cope autonomously with the overvoltage protection, voltage balancing, and the management of warnings from the temperature and gas sensors.
- Efficient: All the auxiliary components have been designed in order to reduce as much as possible energy losses during its normal operation. For example, the active voltage balancing circuit as been specially designed in order to be able to transfer up to 15 amperes between individual supercapacitors with an efficiency bigger than 98%.
- Safe: Predictive maintenance strategies have been implemented to predict possible substitutions of supercapacitor stacks or auxiliary components before their malfunctioning affects the entire system.

Status

Several prototypes have been developed and validated in the frame of R&D projects. Some of them will be industrialised in 2013.
In parallel with this technological development, CEIT in collaboration with other European partners is coordinating a European Initiative (FP7 HESCAP project) oriented to the development of a new supercapacitor technology capable of storing ten times more energy than the reported State of the Art devices, while keeping the high power density, long life cycle and production cost of currently available supercapacitor systems. HESCAP project will end in 2013.

Applications

This technology is directly addressed to, among others, the following applications:

- Hybrid and full-electric vehicles and their charging networks.
- Voltage stabilization support to the electric smart grid.

Potential cooperation partners / Customers

OEMs, Electric traction system suppliers, energy storage system suppliers.

Battery Modules and Packs for Traction Applications

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IK4 Research Alliance

Technological description

IK4-CIDETEC has developed a lithium ion battery module technology capable of extracting the maximum power and energy from the cells, while preserving their lifetime by means of an efficient equalization and thermal management strategy.
The main functions developed for the Battery Management System (BMS) are:

- Algorithms for state of charge —SOC— and state of health —SOH— estimation based in Kalman filter calculations.
- Cell equalization.
- Communications, protections, safety.
- Passive and active liquid & air cooling.

As an improvement over other state of the art BMS's, the algorithms implemented are obtained from a detailed program of optimized, accelerated testing of the actual cell type to be used in the module. This testing program includes charging and discharging at selected rates and temperatures, including accelerated cycling. With this strategy, the BMS is capable of estimating the SOC with actual precision under 1%. A master controller at the battery pack level has also been developed.
IK4-CIDETEC cooperates closely with its partner and customer CEGASA Company in this development.

Status

Our state of the art lithium ion modules –pouch cell based- are available in the kWh size range.

Applications

Lithium ion technology is well known as the technology of reference for all kinds of electric and hybrid vehicles. Also, li ion batteries are suitable for energy storage at recharge points to handle transitory power surges.

Potential cooperation partners / Customers

IK4-CIDETEC is open for cooperation for further technology development at the battery module electronics and thermomechanical design, either in the context of European projects or specific agreements.
IK4-CIDETEC is coordinator of the FP7-GreenCars projects GREENLION ("Advanced manufacturing processes for Low Cost Greener Li-Ion batteries") and MARS-EV ("Materials for Ageing Resistant li-ion Storage for the Electric Vehicle").

Lithium-ion battery technology for electromobility

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Technological description

At IK4-CIDETEC several battery technologies are under development towards to the electric vehicle. Taking advantage from our extensive expertise in electrochemistry, industrial processes and product development, this development is focused into two main technologies: lithium ion for the short to medium term, and metal/air for the long term.
IK4-CIDETEC is working on lithium ion technology from the starting raw materials up to the cell, covering:

- Materials selection (active, inactive and structural).
- Electrode formulation and coating at the pilot plant level (organic solvent free process).
- Pouch type cells from 1 to 30 Ah (also mAh size button cells for materials testing).
- Procedures for electrolyte filling, formation, and cell degassing steps.
- Full electrochemical, thermal and abuse testing of lithium ion cells.

The knowledge developed allows to taylor the electrode and cell characteristics to optimize energy and density, safety, durability and cost.
Metal/air technologies are seen as the next step in battery development. They offer the promise of an energy density several times higher than li ion batteries. IK4-CIDETEC is focusing efforts in Zn/air rechargable batteries, as well as other promising technologies such as Li/S (lithium/sulfur).
IK4-CIDETEC cooperates closely with its partner CEGASA Company for battery technology development.

Status

Our state of the art lithium ion technology is available at pouch cell level of up to several ampere-hours capacity. Metal/air is at the laboratory stage, with lab test cells already demonstrated.

Applications

Lithium ion technology is well known as the technology of reference for all kinds of electric and hybrid vehicles. Also, li ion batteries are suitable for energy storage at recharge points to handle transitory power surges.

Potential cooperation partners / Customers

IK4-CIDETEC is open for cooperation for further technology development at the materials/cell level, either in the context of European projects or specific agreements.
IK4-CIDETEC is coordinator of the FP7-GreenCars projects GREENLION ("Advanced manufacturing processes for Low Cost Greener Li-Ion batteries") and MARS-EV ("Materials for Ageing Resistant li-ion Storage for the Electric Vehicle").

Advanced AGM Lead-Acid batteries (spiral shape) for Mild-HEV market

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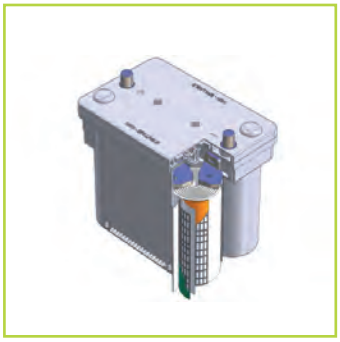


Technological description

Advanced Lead-Acid batteries with spiral cells (that allows thinner electrodes and higher compression assembly) have been developed with some additives into their Active materials and design features that improve existing performances in the following aspects:

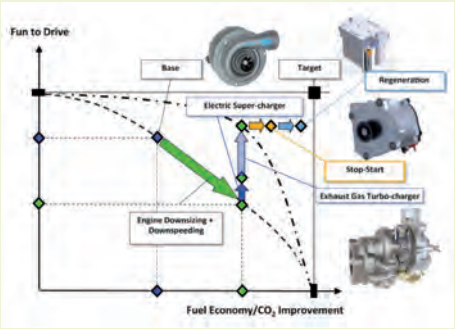
- Power peak performances → Higher Specific Power rate → Boosting events.
- Charge acceptance → Higher Specific Charge Acceptance rate → Regenerative Braking.
- Cycle life under Partial State-of-Charge (PSoC) → EUCAR HEV driving profile → Cycle life under HEV applications (Micro- & Mild- Hybrid).

Status

12V Battery (series product) assembled into a Demo Car (VW Passat 1,4l TSI "retro-fitted"). Next step is a 48V system (under development) with 8 x 6V modular assembly.

Applications

Combined with electric Super-Charger and ISG technologies can bridge the gap between micro- and mild-hybrid with a cost effective alternative to high-voltage solutions (made of more expensive battery chemistries). Whole system is capable to near-term down-sizing and down speeding the existing engine families, delivering proven CO_2 reduction and fuel economy without the usual dynamic compromises.



Potential cooperation partners / Customers

PARTNERS: VALEO, CPT, MUBEA, AVL SCHRICK, PROVECTOR.
CUSTOMERS: All electrical suppliers interested in cost-effective hybridisation projects.

BMS: Battery Management System

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Technological description

Battery Management System includes all the hardware PCB's and software algorithms that ensures the following functions in a Battery Pack System:

- To monitor up to 1680 Lithium-Ion cells.
- To balance the cells charge (passive energy balance).
- To control the charge and discharge rates.
- To improve the battery pack autonomy.
- To keep the system under safe conditions (ASIL D compliant product).
- To include thermal management algorithms which are able to maintain the cells into an optimized temperature range.
- To predict the State of Charge (SOC) and State of Health (SOH) with <2% error.

Status

Pre-series.
Start of production: 2013.

Applications

EV / PHEV.

BPS: Battery Pack System

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Technological description

The Battery Pack is a system able to store energy to propel Electric / Hybrid vehicles, as cars, buses or motorbikes using modern Lithium-Ion cells which provide enough energy density to allow short and medium drive autonomy.
The battery Pack system design can be customized to different requirements. First prototype sample provides 12kWh with an output voltage of 270-320 Vdc by using Li-ion NMC pouch cells.
The Battery Pack includes a Battery Management System (BMS) that is able to control the charge and discharge rates, the energy balancing in order to improve the autonomy and to keep the system under a high-safe conditions. BMS also controls the power distribution box (TNV) that provides all protections for the own battery pack integrity and for the users safety.
BPS also includes a Thermal System (air cooling or liquid cooling) which is able to handle 1000W and thermal management algorithms which are able to maintain the cells into an optimized temperature range (from 0 °C up to 50 °C), to maximize their lifetime.
Automotive grade product with mechanical housing ensuring IP65 protection.

Status

Prototype.

Applications

Designed for EV / PHEV / Hybrid cars, buses applications.

Technology: Electrical Energy Storage

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Technological description

Component development (HW/SW) for electrical energy storage:

- Battery technology analysis and selection.
- Battery module and pack Topology and Control Development.
- Battery Module Thermal Design and Control.
- Battery Management Systems (BMS) development.
- Optimized battery chemistries and materials for optimized life-time and cost of EV batteries, as well as second use in storage for renewable energy plants: see project Batteries2020 (www.batteries2020.eu).

Status

These technologies are currently in use in other transport sectors (rail, light rail, vertical transport...) or in stationary applications (domestic, industrial).

Applications

Full electric and hybrid electric vehicle energy storage applications.

Potential cooperation partners / Customers

Vehicle manufacturers (OEMs), EV electrical energy storage manufacturers, vehicle design houses.

Battery Ancillaries

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Technological description

1. Battery Monitoring System: Stand-alone BMS senses real-time battery parameters and processes them to provide battery status variables, through CAN or LIN bus, thus enabling vehicle start/stop functionality and other power management objectives. Very compact design, together with specific IP, provides best solution for all vehicle platforms.
2. Manual Service Disconnect:
   - Safely disconnects battery for high voltage system service operations.
   - Provides HV main battery fusing.
   - Utilizes proprietary off-the-shelf terminal and connector systems.
3. High Voltage Junction Box: HV-battery power management unit combining the main HV-contactors with the voltage and current monitoring, and the basic HV-protection features. Optimized design, with ASIL C requirements, achieved by using the newest state-of-the-art technology devices.
4. Dual Battery Module: Lear's Dual Storage Management Unit supports micro hybrid vehicle power networks by seamlessly managing current flow from multiple 12V power sources such as batteries and/or ultra capacitors. With available integrated voltage quality functionality the Dual Storage Management Unit enables start / stop functionality via an optimized power storage and distribution system for voltage sensitive loads.

Status

1, 2: Already in production.
3: Under development.
4: Demonstration sample.

Applications

1: Monitor the battery State of Charge and State of Health.
2: High Power manual switch to disconnect High Voltage Battery.
3: Power distribution, protection and battery measurements (V.I) in an electrical vehicle.
4: Dual 12V sources energy flow management.

Potential cooperation partners / Customers

1: Currently for EU OEM and in discussion with other OEMs.
2: In production for US OEMs. In discussion with European OEMs.
3: In production for US OEMs. In development with European OEMs.
4: Discussions with different European OEMs.

Development of Industrial Supercapacitors with novel material

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Technological description

To support the change of energy sources (based on fossil energies) we need to increase the energy storage possibilities. The most commonly used systems now are batteries (e.g. lead acid batteries or lithium ion). But they suffer a lack of power density (< 2,000 W/kg) and life-time (< 5,000 cycles) for applications (electrical vehicles, photovoltaic, mobile electronics...). Since 30 years, a new type of energy storage device is studied and developed: supercapacitors. They are filling the gap between batteries and capacitors in term of energy and power densities (Table 1). Supercapacitors also have a longer life-time than batteries (up to 1,000,000 cycles).
The objective of this work is to develop modular storage energy devices in term of specific energy and power from cheap raw materials at the scale of the industry for being used as a single energy storage device or coupled with other system. In partnership with national Spanish companies, Leitat works for integrating the technology of supercapacitor in different sectors as the automotive or the solar conversion energy systems. In the particular case of materials, new intrinsically conductive polymers, low-cost sources for carbon-based electrode, novel separator membranes have been prepared with the final goal of their application as key elements in supercapacitors. It is also envisaged the development of two "proof of concept" for energy storage in: (i) lead-acid battery replacement for solar-powered systems; (ii) complement to Li-ion batteries in electric vehicles. Prototypes have been assembled and electrical modeling has been realized for the integration of first prototypes with innovative materials in HEV.

Status

- Materials (i.e. active material, separator, complete electrode) have been synthesised and electrochemical tested (i. e. capacity, energy, power, equivalent series resistance) at the scale of the laboratory in coin cell configuration.
- 1 m length both separator and complete electrode have been prepared for the building of supercapacitors at the industrial scale (prototype).

Applications

- Automotive: Regenerative Braking Systems, Start-Stop Technology Gets a Boost from Ultracapacitors, High power consumer support (e.g: air conditioning compressors).
- Transportation: Bus and truck starter systems, System of opening for aircraft doors, Energy storage at tramway station
- Renewable energies (wind & solar): Used for wind turbine pitch control systems, Voltage regulation (absorbed peak voltage).
- Uninterruptible Power Supply (UPS): Datacenter UPS, Telecommunications, Hospitals and medical life sustaining equipment.

Potential cooperation partners / Customers

- Private or public companies in the field of the transportation (Train, bus, tramway, aeronautic, car). Several example of the use of supercapacitors for transportation are available in Europe (e. g. Tramway) or in Asia (e.g. Diesel / supercapacitor hybrid grave). Supercapacitor could be integrated in the construction of the hybrid or full electrical car (HEV, FEV).
- Supercapacitor could be used everywhere where it is need to stored or delivered high power (energy in a short period). Indeed, this technology could be also integrated in the smart grid for levelling the drastic changing in power for replying to the consumption needed of the final user.

Portable batteries for e-bikes

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Technological description

An interactive and portable energy storage device for Electric bicycles.
This product not only incorporates the traction function, it is also conceived as an interactive, compact, portable and autonomous energy storage device, equipped with three new features:

- A wireless communication system that enables the management of its status (capacity, load level, time remaining, range, etc.) by connecting to electronic devices such as SmartPhones.
- Low-level USB voltage output for charging or supplying electronic devices.
- Authentication module designed for verifying the suitability of the voltage level / current between a battery and a motor controller.

The user recharges it in a domestic / work environment. It will allow them to ride for around 30-40 minutes, covering a distance of 12.5 - 15 km, with an approximate weight of 800 grams.

Status

The prototype is being designed. Demo available in few months. Expected end of 2013.

Applications

The aim of this project is to transform the conventional bicycle sharing system to an electric sharing system, minimizing the required investment for the municipality. If one aims to develop an electric bicycle system, the first approach planned is to locate various recharge points on the streets, into which the bicycles will be plugged in order to recharge.
This model incorporates three negative aspects.

1. It involves an expensive infrastructure for recharging bicycles in the street.
2. It must incorporate a charge-level indicator in the bicycle so that an uncharged bicycle isn't used.
3. The batteries in the bicycles will be subjected to inclement weather conditions which will drastically reduce the useful life of the battery.

To address these negative aspects, we propose to detach the battery from the bicycle. Thus, the battery becomes an element that the urban biker carries with them and connects to the bicycle whenever they want to continue their journey using electrical propulsion. The bicycle includes all of the necessary drive equipment: motor, control mechanism, a pedal assist mechanism. This is a hybrid system which allows users who wish to do so to use electrical propulsion or, alternatively, use the bicycle in a "conventional" manner.

Potential cooperation partners / Customers

- Cell manufacturers.
- Electronic designers.
- Bicycle sharing systems providers.
- Investors.

EMIC System

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Technological description

Lithium rechargeable modular battery system which offers flexibility of autonomy (energy and power) to electric vehicle users.
Each cartridge is consumed independently, the vehicle can drive with one, two... cartridges based on the autonomy required by the user.
Different modules are managed through an intelligent electronic board (patented) and are portable to allow easy charge at home/office; the user doesn't need to look for recharge points, because the cartridges can be recharged at any point on the grid.
Targeted for small electric vehicles (bikes, scooters, tricycles, quads) able to withstand different charging regimes.
The added value of the system is for the user and for the manufacturers. The user buys the cartridges according to the needs and requirements in everyday use, therefore, the manufacturer can reduce the price of the vehicle. Furthermore, the system allows to employ different business model for its commercialization.

Status

Prototypes and pre-series production are manufactured until the end of 2012 to start commercial activity in January 2013. First production line inaugurated in Reus (Tarragona) on June 6th 2012.
Full tests of EMIC system in laboratory and scooter carried out since April 2011 in CONVEHIDOR technological platform as well as in some selected customers.

Applications

Targeted for the traction of light electric vehicles (bikes, scooters, tricycles, quads) in urban and tourism environments as well as fleets in big facilities (airports, shopping centers, plants, etc.).

Potential cooperation partners / Customers

The open technological platform CONVEHIDOR, dedicated to R&D on energy storage and related devices oriented to the application in the two-wheel sector, was created in 2010. Companies and institutional partners involved in this industry are invited to participate in its developments, as well as customers needing high technology batteries for the mobility sector.

Power electronics and ancillaries

Power electronics for electric traction and storage

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Technological description

During the last ten years, the CEIT's Industrial Power Electronics Group research has been oriented to the design and development of high performance power converters. In addition to standard AC-DC-AC rectifier-inverter based power converters, the group has experience on high current – high frequency resonant DC-DC converters and direct AC-AC Matrix Converters.
As far as high performance DC-DC converters are concerned, commutation frequency has been successfully increased up to 100 kHz for research and industrial applications. In particular, a 100 kHz (MOSFET based) resonant bidirectional DC-DC converter has been designed and implemented for voltage regulation of a Supercapacitor stack in a smart grid. It consists of a MOSFET full-bridge + LC filter + transformer + MOSFET full-bridge, so that bidirectional operation is assured (DC-AC-DC). This way, a standard inverter bus can be powered (after another DC-DC boost stage) and the system is able to send energy to the grid in a controlled way. Reversely, bidirectional topologies design allows the energy storage system to be charged back from the grid as needed or demanded. In a similar way, bidirectional operation can be used to connect Supercapacitor modules to the DC-Link in electric vehicles. This allows extending the useful life of the batteries by decreasing the current peaks during normal and regenerative states. Increasing the commutation frequency has allowed us to reduce significantly the volume and weight of inductive components in our converters. As a whole, the system is able to manage power demands up to 100 kW during 1 s and 20 kW during 30 s.

Status

- 3 Phase DC-AC inverter (Starter of a Diesel Engine in a Auxiliary Power Unit):
  - DC bus of 48 Volts; Nominal AC Current of 300A during 15 seconds.
  - Temperature range: from -40 °C to 125 °C.
- Resonant DC-DC bidirectional power converter for a Battery Management System:
  - Nominal Power: 40 kW (4 parallel configuration of 10 kW).
  - Voltage range: 750V-50V (53A-800A); Commutation Frequency: 50 kHz.
- Direct AC-AC Matrix Converter [Nominal Power: 7.5 kW (400V)].
- New Commutation and Modulation Strategies.

In parallel, CEIT is coordinating a European Initiative (FP7 HEMIS project; 2012-14) oriented to the development of a prognostic health monitoring system for the powertrain of Full Electric Vehicles . This system will be able to assess the failsafe condition of the powertrain, as well as diagnose and predict failures, estimating the remaining useful life on the powertrain's components. This will allow a predictive maintenance policy.

Applications

Hybrid & Electric vehicles.

Potential cooperation partners / Customers

OEMs, Electric traction system suppliers, energy storage system suppliers.

Lion 20/50 decoupling system. B2G-Storage Management

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Technological description

Lion 20/50 is a Power Electronic system design to manage Ion-Lithium Stationary Batteries and integrate local renewable energies.
The system could be installed in Fast Charge.
The Lion 20/50 Decoupling System is conceived to reduce the peak demand of 50kW of a fast charging Electric Vehicle Supply Equipment (EVSE).
The accessible DC bus allows the integration of renewable energy sources (wind and/or photovoltaic power), increasing the energy transfer efficiency and reducing the grid consumption.
The Lion 20/50 Decoupling System incorporates a local management system that controls, monitors and registers the energy flows of the electric microgrid.

- SCADA application for controlling, monitoring and data logging.
- Configurable Demand Smoothing Strategy.
- Reactive Power compensation.
- Communication with local management systems.
- Electric Mobility systems Integration.
- Easy integration with renewable energies sources.
- Easy Installation and fast Maintenance.
- Future upgrade capabilities.

Lion 20/50 Decoupling system basic.

- Bidirectional operation from 20KW up to 50KW.
- Ion-Lithium Stationary batteries compatible.
- Local management system.
- Human Interface.
- Max Charging/discharging Power 20/50 kW.
- Utility connection 400V AC, 50Hz.

Local Management System communications.

- Power Electronic system implemented using Modbus protocol over RS 485/232.
- EVSE power meter implemented using TCP/IP protocol.
- Renewable energies generators implemented using Modbus protocol over RS 485/232.

Status

System already working with Endesa Fast Charges.

Applications

- Private environments with public use (Fast Charging Stations).
- Vehicle fleets.
- Energy efficiency.

Potential cooperation partners / Customers

Testing other applications related with home storage and V2H.

OBC: On Board Charger

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Technological description

The On-board Battery Charger is designed for charging the high-voltage traction battery from the domestic AC network. It is able to supply other HV-components during the charging process of the Battery Electric Vehicles (BEV) and Plug-in Hybrid Electric Vehicles (PHEV).
OBC converts AC to DC with high efficiency (Power factor >0,98. Efficiency >95%.), handling up to 3.3KW of power. It is compatible with international power grids and charging modes 1, 2 and 3 (according to IEC61851). Provides galvanic isolation between the AC network, the HV-battery and the supply car-network. Communicates on the vehicle CAN networks (i.e. 2 different interfaces. including wake-up on CAN capability). Manages AC plug interfaces, together with signaling LEDs and charge profile selection button. Sensing of control pilot signal for mode 2/3 is included. OBC is prepared for direct interface to charging station in DC-charging fast mode. The charging interface is done using CHADEMO standard plug and PLC communications. Several safety features are included like the plug interlock mechanism and charging flap control.
The system is liquid cooled using and aluminum cold plate. The nominal power of 3.3KW is maintain up to 70 °C coolant input temperature. Electronically limited control allows a soft power derate from 70 to 75ºC (maximum working temperature).
Automotive grade product with mechanical housing ensuring IP659K protection, AEC-Q graded components and dual microcontroller design for increased safety concept.

Status

Prototype.

Applications

With a wide output voltage range, the automotive-grade charger is robust and ideal for a broad range of PHEV/EV applications.

Technology: inverter development

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Technological description

Inverter development for:

- Chargers (DC/DC, AC/DC) and range extenders.
- New and efficient topologies and control algorithms.
- Inverter Thermal Management System Design and Development.
- Recharging points.

Status

Many of these technologies are currently in use in other transport sectors (rail, light rail, vertical transport...) or in stationary applications (domestic, industrial).

Applications

Full electric and hybrid electric vehicle, range extenders, charging and vehicle-to-grid infrastructure.

Potential cooperation partners / Customers

Vehicle manufacturers (OEMs), EV component manufacturers, vehicle design houses, recharging infrastructure developers.

Power electronics and EMC for electrical traction systems

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Technological description

The Power systems and EMC group at ITA is focused on the design and development of new solutions oriented to optimize the energy efficiency and performance of electrical and electronic systems mixing new technologies based on energy storage devices (super-capacitors, batteries) and power converters. The proposed solutions will consider every aspect related to EM interference phenomena from the design stage to achieve compact designs.

- Energy storage device characterization:
  - Characterization and/or study of safety requirements of new energy system devices.
  - Cycling, standardized tests and thermal analysis as well as the development of new characterization techniques and stress test based on real measurements and simulation.
  - This analysis is used in combination with climate chambers and vibration machines.
- Regenerative power system design:
  - Power converter design, including computer simulation model of the converter in time and frequency domain for performance and noise analysis.
  - Prototype development of converters as well as high energy efficiency system (up to 5 kW).
  - Component or system optimization.
- Electromagnetic compatibility:
  - Electromagnetic simulation models.
  - New test development.
  - Electromagnetic characterization of any system or components.
- Electrical mobility analysis:
  - Quasi-dynamic model development.
  - Route characterization by GPS.
  - Driving patterns characterization.

Status

- Relevant achievements (demonstrators) associated to different projects:
  - Bi-directional power converter to characterize batteries and supercapacitors.
  - Electromagnetic characterization of electric/hybrid vehicles (component & system level).
  - Route characterization for electro mobility analysis (component and system level).
  - EV Powertrain test bench for systems and components evaluation (component/system level). Operational in 2014.
  - Applications.
- The previous activities can be applied to several aspects related to electric and hybrid vehicle:
  - Design of Power converter (up to 30 kW) and power systems.
  - Energy storage device (supercapacitors and batteries) characterization.
  - Electronic systems and installation design based on EMC.
  - EMC component selection & design.
  - Filtering, cabling, grounding & shielding topologies.
  - Non-standardized tests development for system integration.

Potential cooperation partners / Customers

EV, components/battery manufacturers, energy companies, system integrators, public administrations, universities.

EV On Board Chargers and Ancillaries

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Technological description






1. **Universal 3.3 kW on board charger** for Electric Vehicle battery charging in 8h from domestic mains powergrid (110/230 Vac, 16 A, 50/60 Hz).
2. **7 kW on-board Charger:** for electric vehicle charging (faster than slow 3,3KW). As a variant, possibility to offer also V2G capability (bidirectional capability) for smart power grids.
3. **20 kW on-board Charger - bidirectional,** for electric vehicle fast charging (<1h). As a Variant, possibility to offer also V2G capability (bidirectional capability) for smart power grids.
4. **Electric Vehicle Supply Equipment** Safely enables connection & warning from the electrical grid to plug-in hybrid and/or electric vehicles. SAE J1772™ and IEC compliant. Level-1 travel cord and Level-2 wall mounted designs available. Adaptable to country wall plugs.
5. **Charging Connection:** connectors and W/H for vehicle to home connections (either in vehicle or stand-alone). Compliant with SAE J1772TM and IEC62196-1 & 2, customized branding and capabilities from 6 to 32 A.

Status

1, 4, 5: Already in production.
3: Validated prototype.
2: Series Development.

Applications

1,2: Charging HV batteries for HEV/EV from domestic main grid.
3: Quick charging HV batteries for HEV/EV from domestic and 3-phase main grid. If bidirectional, the car could supply the grid.
4, 5: Connect the EV vehicle to the domestic grid for charging.

Potential cooperation partners / Customers

1,3: Currently in production for European & US OEM and also others under development.
2: Under discussion with OEMs.
4, 5: US OEMs. In development with European OEMs.

Junction Boxes and Connection Systems

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Technological description

1. Smart Junction Boxes and Body Electronics: Smart Smart Junction Boxes and body control modules control numerous basic vehicle functions including door locks, interior and exterior lighting, wipers or power management. Also integration of complex functions into one module to save cost, reduce weight and fit into restrictive vehicle's architectures (key-less access, park assistance, tire pressure monitoring, gateway).
2. Connection System: Full portfolio of connectors for 12V electrical distribution systems.
3. Wire harnesses (Low & High Voltage): Portfolio includes complete system capability, proprietary technology and production proven performance.
4. High Power Connection Systems: Connectors for hybrid and electric vehicle high power electrical systems, with a full portfolio of header, in-line, board-to-board and specialty options.

Status

1, 2, 3, 4: Already in production.

Applications

1: Body Functions controls and Gateway functionality.
2: Connections Systems (Terminals & Connectors) for 12V W/H.
3: Wire Harnesses for different zones and functions for Vehicles (Traditional & HEV/EV ones).
4: Connections Systems (terminals & Connectors) for HEV/EV W/H.

Potential cooperation partners / Customers

1: In production for All major OEMs worldwide.
2, 3: In production for all major OEMs worldwide.
4: In production with worldwide OEMs.

DC-DC Converters and Inverters

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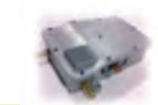
Technological description





1. Integrated Power Module
   Alternative combination of de different power electronics functions (DC-DC converter, power distribution box, traction inverter, AC power plug and battery charger) to suit OEM demands. Energy efficiency through reduction of magnetic losses, size & weight, and elimination of connectors.
2. Traction DC-AC
   HV DC to 3-phase AC to drive the traction motor. Can be customized over a range of input voltages and power levels up to 320 kW. Liquid cooled for compact package size and ASIL compliant.
3. High Power 400Vdc -> 12Vdc Converter
   For a wide variety of input and output voltages for mild, full, plug-in, fuel cell, and electric vehicle configurations. Unidirectional step down (buck) designs. Water cooled.
4. Smart Energy Gateway
   Multi input-output DC/DC converter for energy efficient ICE vehicle. Able to operate in several modes: Direct or Reverse conversion, Recharge from harvesting / external device and Equalization of batteries.
5. High Power 48Vdc <-> 12Vdc
   Bidirectional DC/DC Converter able to operate in both buck and boost mode depending on energy direction, scalable in power up to 3kW. Liquid or air cooled options.

Status

1: Demonstration Sample.
2: In series development.
3, 4: Validated prototype.
5: Under Development.

Applications

1: Integration of several power electronic modules into a unique module.
2: Electrical vehicle traction.
3: Electrical vehicle 12V power supply from HV battery.
4: Energy flow management with energy recovery from different potential vehicle power sources.
5: Energy transfer between 48V and 12V Power Supply Systems.

Potential cooperation partners / Customers

1: Presentation to OEMs.
2, 3: In Development for US OEMs. In discussion with European OEMs.
4: European collaboration project with European OEMs.
5: Presentation to OEMs.

Powertrain: Advanced ICES, e-motors

Electric traction motors

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Technological description

More than 10 years experience in the design and development of electrical drives permits CEIT-IK4 to provide full design of conventional electric motors. This full design approach includes electromagnetic, thermal and mechanical design, insulation systems and the application of optimization techniques to achieve targeted specifications.

- Electromagnetic design and analysis:
  - Induction, reluctance and surface, inset PM rotors.
  - Intrinsic fault tolerance.
  - Concentrated and distributed windings.
  - Multiphase machines.
  - Electric insulation.
- Thermal and mechanical design:
  - CFD AND FEM simulation.
  - Self ventilated, TEFC, TEBC, TEWC.
  - Cooling systems for Power Electronics + machine.
- New electromagnetic materials:
  - Soft Magnetic Composites: low and high frequency.
  - New materials for next generation permanent magnets.
- Condition monitoring:
  - On-route health monitoring.
  - Wireless data transmission from rotor to stator.

Status

- Design of a 100kW PM motor for marine propulsion:
  - Radial flux rim drive.
- Design of linear PM motors for the elevation sector:
  - Surface, buried and Halbach array magnet topologies.
- Design of a starter/generator for road vehicles:
  - Extreme environmental conditions.
- Optimization of in-wheel PMSM for electric motorcycles:
  - In-wheel outer rotor configuration.

Applications

Hybrid & Electric vehicles.

Potential cooperation partners / Customers

OEMs, Electric traction system suppliers, energy storage system suppliers.

Engine Covers

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Technological description

Engine Covers provide one of the main acoustic barriers for the noise generated by the current gasoline and diesel engines. Engine covers provide also a thermal barrier and may be also a styling element of the engine compartment. Engine covers are produced worldwide using CIE Automotive manufacturing capabilities including injection moulding and assembly processes.
To meet increasing acoustic and thermal requirements of new engines CIE Automotive is developing new materials, processes and design capabilities to achieve:

- Higher working temperatures.
- Improved acoustic absorption.
- Reduced weight.
- Better cost/performance absorbers.

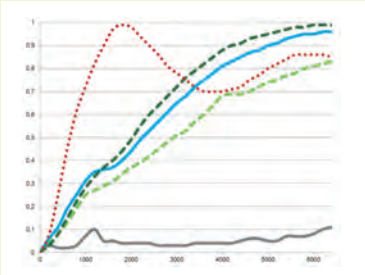

Figure: Sample engine covers and acoustic data.

Status

Series & prototype.

Applications

New automotive engines.

Potential cooperation partners / Customers

OEMs.

Fuel Capless System for advanced ICEs

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Technological description

Capless System to avoid removing the cup for refueling. It will be valid for both Diesel and Petrol including following main characteristics:

- Reduction of Hydrocarbons emissions to fulfill with Euro6.
- Poka –yoke to avoid fuel confusion.
- Comfort and Cleanliness for the End User.

Will be produce in CIE Automotive worldwide using Plastic injection, Stamping and Assembly processes.

Status

R&D.

Applications

All type of Vehicles with Combustion engine (Diesel / Petrol).

Potential cooperation partners / Customers

OEMs.

Rails (Fuel & Common rail) for advanced ICEs

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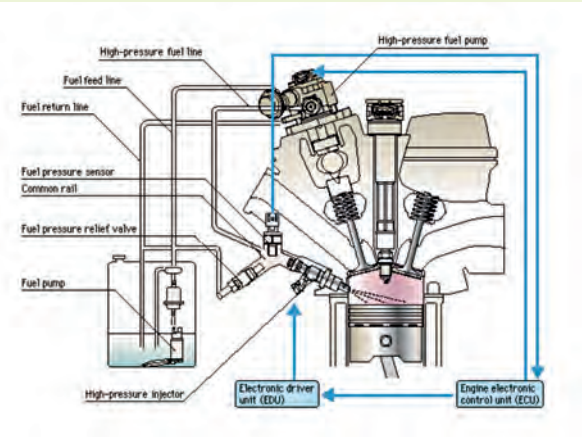
Technological description

Rails for current gasoline and diesel engines are manufactured with a variety of technologies which are the core know how of CIE Automotive. However, engine optimisation trends to reduce the emissions and improve the fuel consumptions demand higher injection pressures and therefore the introduction of new functions in the current systems.
CIE Automotive is developing new materials and technologies that help improve the performance of injection system of vehicles to reduce its impact on the environment (increase fuel efficiency and meet exhaust emissions standards). The main areas of investigation are as follows:

- Design the injection components (including pressure relieve valves and pressure sensors) and investigate about new materials to withstand the new injection pressures (350 bras for gasoline and 3,000 bars for diesel) on the new systems and on the new alternative engines (dual-fuel engines).
- Develop alternative manufacturing processes suitable for the new components and material previously developed.



Status

Series & prototype.

Applications

New automotive advanced engines.

Potential cooperation partners / Customers

OEMs and TIER 1 injection system suppliers.

Powertrain Control

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Technological description

The interest on Hybrid Electric Vehicles (HEV) has risen during the last years due to the increasing cost of fossil fuels and environmental concerns. The introduction of new energy sources and actuators in the powertrain leads to additional degrees of freedom in the system, setting out a new problem in which the amount of power delivered at each instant by the energy sources present in the vehicle has to be decided. The control of the whole Powertrain, including the thermal engine and the set of electrical devices becomes a complex and multi-disciplinar problem whose solution has a strong impact on the vehicle performance.
CMT Motores Térmicos has wide and proven experience in the control of thermal engines, and during the last years has extended this expertise to the control of the whole Powertrain, including HEVs with different configurations. The areas covered by CMT Motores Térmicos include the design of control strategies aimed to minimize fuel consumption and emissions, and the experimental evaluation of those strategies. CMT Motores Térmicos facilities include Powertrain test benches and control unit prototyping systems to evaluate the proposed strategies.

Status

Both experimental facilities and modelling software are available.

Applications

Both the staff and facilities available at CMT-Motores Térmicos allow to the study, the comprehension and the analysis of control strategies applied in current powertrain elements or the development of the new control strategies aimed to improve the powertrain performance.

Potential cooperation partners / Customers

CMT-Motores Térmicos are at the disposal of any customer interested in evaluating /developing the powertrain management strategy or the control of particular elements in the engine or powertrain.

Multi-functional exhaust manifold: pre-turbo aftertreatment architecture

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Technological description

Nowadays, Diesel engines have become the most efficient propulsive system in automotive applications, both for passenger and heavy duty transport. Significant achievements in performance improvement and emission reductions have been reached in the last years. However, future emission regulations demand further reductions of pollutant emissions leading to an extensive implantation of aftertreatment devices.
Usually, the DPF is placed in a post-turbo location downstream of the DOC to take advantage from the NO_2 generation and the increase in temperature due to DOC exothermic chemical reactions. Nevertheless, passive regeneration occurrences are not frequent during actual engine operation and the need for active regeneration strategies damages fuel consumption besides the increasing back-pressure as the DPF is loaded.
These effects of aftertreatment systems can be mitigated approaching for a pre-turbo placement of the DOC and the DPF. Immediate advantages of this architecture are identified in terms of higher thermal level favouring passive regeneration occurrences in the DPF and enhancing DOC light-off and conversion efficiency. Additionally, the pre-turbo aftertreatment placement highly reduces the pressure drop across the DPF because of the flow conditions upstream of the turbine and reduces the pumping losses due to the fact that the DPF pressure drop is not affected by the turbine expansion ratio to set the engine back-pressure. As a consequence, bsfc is reduced besides lower requirements in catalyst concentration in ceramic substrates and DOC size. Other benefits derived from the pre-turbo DPF placement are: (i) a proper design of the filter packaging can allow it to act as isolator of interferences between the exhaust processes of consecutive firing order cylinders; (ii) maximum EGR rate increase in heavy duty engines because of flow lamination; (iii) clean high-pressure EGR; (iv) gas-urea mixing without swirl generators due to turbine swirl use in SCR; (v) possibility for EGR pre-cooling through an air gap surrounding the aftertreatment reducing also heat losses; (vi) turbocharger lag removal during full-load transient accelerations under hot wall temperature conditions.

Status

Currently, theoretical and experimental studies have been performed in order to assess the performance of light and heavy duty Diesel engines with pre-turbo aftertreatment architecture. First in-home prototypes have been manufactured and the inclusion of thermal insulation based on double wall with EGR gap is planned by 2013.

Applications

Multi-functional exhaust manifolds have as target use any kind of turbocharged Diesel engines regarding both light and heavy duty applications.

Potential cooperation partners / Customers

CMT-Motores Térmicos area of expertise is research in thermo- and fluid-dynamic processes of IC Engines. Therefore, industrial partners with manufacturing capabilities for prototype improving are sought. Industrial partner in the automotive sector would be also welcome to develop the engine setup with the proposed architecture.

μDiesel & downsizing limits

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Technological description

Despite engine downsizing is a widespread technique to reduce vehicle energy consumption and emissions keeping similar vehicle performance, engines are still operating at partial load for most usual driving situations, which burdens fuel efficiency. A possible way to reduce the vehicle fleet energy consumption is to fit the vehicle power-plant to its real requirements, thus allowing the engine to run at more efficient conditions.
Accordingly, the μDiesel is a compact, light engine, providing high specific power (kW/l and kW/kg), and with a low power output (about 20-30 kW for small size vehicle concepts). Of course, since the reduction of fuel consumption is the driving factor of the μDiesel, it should have a similar efficiency than a state-of-art automotive Diesel engine, it is an efficiency around 40%.
Despite recent technological development has pushed the Diesel engine specific power beyond 50 kW/litre and brake mean effective pressure (BMEP) beyond 20 bar it is not currently possible to extend automotive CI engine technology to the low power region (about 20-30 kW). Hence, development of the μDiesel engine remains still a challenge due to limits associated with engine heat transfer (as geometrical and operation restrictions give rise to higher heat losses), limits related with the air management of the engine (most notably with turbocharging) and difficulties imposed by the intrinsic nature of injection and combustion processes with reduced space and time scales.

Status

Currently, theoretical and experimental studies focused on the definition and abatement of the limits imposed by thermo- and fluid-dynamic processes to the downsizing of diesel engines have been done in order to assess the μDiesel feasibility under the scope of project TRA2010-16205. The production of a single cylinder research engine with the features of the μDiesel is planned by 2013.

Applications

The target application of the μDiesel is the automotive industry; nevertheless, other applications such as gensets are foreseen.

Potential cooperation partners / Customers

As far as CMT-Motores Térmicos is concerned, its expertise is the research in thermo- and fluid-dynamic processes of Diesel engines, therefore, a partner to afford the organic design of the engine will be welcome. Also, an industrial partner in the automotive sector is sought.

Range Extender, a bridge towards the pure EV

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Technological description

Range Extender is an engine specifically designed for serial hybrid applications, in which the powertrain is electrical. How far the vehicle will travel on pure EV mode depends entirely on the weight of the vehicle and the capacity of the batteries. However, in a city or urban environment, most vehicles will travel no more than 50-100 km so the batteries are typically specified to accommodate this distance. Should the driver wish to drive the vehicle further, the Range Extender engine will start and power a generator which then supplies electricity to power the electric motor. It is the way to overcome the so called "Range anxiety" phenomena of the pure electric vehicles.
Light weight is critical for range extenders and even more for small city and urban cars, where the engine is not being used all the time. The joint-development by Fagor Ederlan and Lotus Engineering has resulted in a low weight engine and powerful solution that reduces weight, package size and cost. The engine offered in 3 cylinder and 2 cylinder version with 50kW, 30kW and 20 kW electrical outputs, could be placed in any orientation from vertical to horizontal or any angle-in-between. The engine architecture and engine management system are designed to offer flex-fuel capability to allow the engine to run on renewable alcohol fuels.

Status

Prototypes are available in 3 cylinder and 2 cylinder version with 50kW, 35kW and 20kW outputs. International Engine Forums, such as Geneva Motor Show, Paris Motor Show, EVS26 LA, Engine Expo or Aachen Colloquium are some of the events in which products are shown during 2012.
Engine availability is planned for:

- Prototype Engines Gen1 – available from April 2012.
- Series Production engines – Potentially available from QTR4 2015 / QTR1 2016.

Applications

Serial Hybrid applications, with electric powertrain. The Range Extender engine is currently being publicly demonstrated in diverse applications.

- Jaguar XJ Limo Green Project hybrid luxury car – running prototypes.
- Proton EMAS hybrid city car – running prototype.
- Lotus Evora 414E hybrid sports car – concept demonstrator / running prototype.

Potential cooperation partners / Customers

Technological partner – Lotus Engineering.
Business partner – Fagor Automation.

Mechatronics

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Technological description

Mechatronics is a core competence of TEKNIKER-IK4 that has applied this competence in different projects and services in line with the Green Card initiative. Some of them are:

- Electro-Magnetic design, control and simulation of electric motors.
- Design and development of inertial wheels (KERS).
- Design of electronic suspension.
- HIL simulation (test benches).
- Design and development of refrigeration systems for batteries.
- Composite component development.
- Optimize stiffness or strength vs. mass ratio, based on static and dynamic FEM models.
- Mechanical device development (mechanisms or other devices with simulation models including drives and control loop).
- Accelerated corrosion tests of motor components.

Status

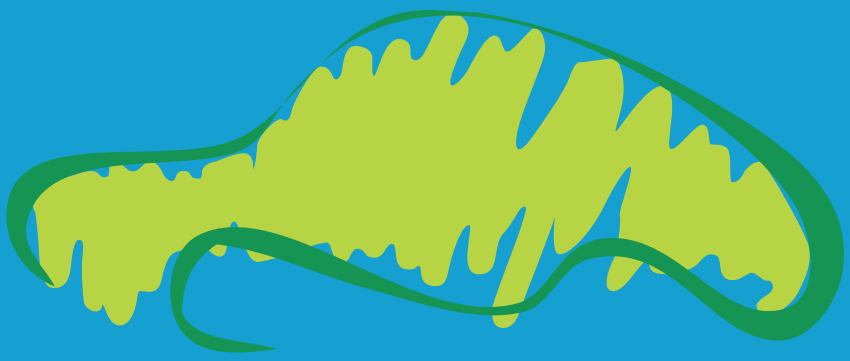
Different designs and prototypes have been developed and validated in the frame of R&D and industrial projects.

Applications

The results can be easily installed in real vehicles components for demo/homologation purposes.

Potential cooperation partners / Customers

Vehicle components manufacturers are indeed cooperating with TEKNIKER-IK4 for the real integration of the proposed solutions into real solutions.



Other vehicle systems: safety, communications, comfort…

EV Fleet Management System

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Technological description

EV Fleet Management platform based on a on-board unit with the following features:

- Real time visualization of vehicle and routes in a GIS environment.
- EV variables access:
  - Battery state of charge (SoC).
  - EV consumption.
  - Influence of environmental conditions (Temperature, weather).
  - SES (Stops, recharges, km).
- On board Unit specifications:
  - Processor:
    16-bit, Speed CPU 40 MIPS, Memory 256 Kb, RAM 8192 Bytes, Interfaces: CAN BUS, Sensors: (UART, I2C, SPI...).
  - Communications and positioning:
    GPRS-GPS, GPS (UTM).
  - Sensors:
    Voltage Sensor (19V-155V), Current Sensor (Hall Effect) (10-450A), Temperature Sensor (-10oC to 110oC), Accelerometer.
  - HMI Interface:
    2 displays BCD 7 segments led, 2 Buttons to indicate use.

Status

The technology is being tested in a pilot implementation of an R&D project.

Applications

EV Fleet Management:

- Improve EV performance in different conditions.
- Better integration of EVs in the 'Smart Grid'.
- Failure and event detection.

Potential cooperation partners / Customers

- EV Fleet Managers.
- EV Manufacturers.
- EV End users.

Technology: Dependable Embedded Systems

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Technological description

Dependable embedded systems (vehicle + infrastructure):

- Vehicle control architectures (HW/SW).
- Communication architecture. Robust communication nodes.
- Vehicle-to-Infrastructure (V2I) connectivity.

Status

These technologies are nowadays in prototype and demo stage of development and some of them are currently in use in other transport sectors (rail, light rail, vertical transport...) or in stationary applications (domestic, industrial).

Applications

Full electric and hybrid electric vehicle, charging and vehicle-to-grid infrastructure, V2I communication, traffic management.

Potential cooperation partners / Customers

Vehicle manufacturers (OEMs), EV component manufacturers, vehicle design houses, public transport companies, traffic management centres, recharging infrastructure developers, hardware/software manufacturers in all these areas.

Mechatronic systems

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Technological description

ITA develops mechatronic systems for automotive industry as:

- Modelling and simulation for design of mechatronic systems (virtual prototyping).
- Advanced (linear and non-linear) control design for mechatronic systems based on models (Software-in-the-loop).
- Virtual green vehicle models for consumption evaluation.
- Code generation for Rapid Control Prototyping.
- Construction of real-time simulators based on system models for emulation of signals for hardware verification and testing (Hardware-in-the-loop).
- Power electronics.
- Embedded systems, real-time communications and software.
- Advanced and intelligent systems integration.
- HMI.
- Test Rigs to develop new automotive components.
- Functional validation.

Status

Several projects have been developed and validated mainly associated to industrial projects.
Successful cases in model-based development of electronic control (V-cycle).

Applications

Development of prototypes which can easily be adapted and integrated in commercial green vehicles.

Potential cooperation partners / Customers

- Companies (OEM's, Tier1 and Tier2) who need collaboration in the design and development of new products, components or systems, considering materials performance as a key factor.
- Partners to participate in national and European public funding projects.

Capturas: ITS platform for connected vehicles and Smart Mobility

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Technological description

At OTCengineering believe that the future of mobility are focused in the connected vehicle and smart mobility, this is the reason why OTCengineering invests in developing products and solutions to connect vehicles and facilitate smart mobility since 2009.
CAPTURAS, the in-vehicle Telematic platform for Connected Vehicles and Smart Mobility, is a modular and customizable solution which solves now a day's requirement of connected car and connected mobility.
CAPTURAS, is the platform to provide in-vehicle connectivity solution which facilitates the communication trough: Vehicle<> Infrastructure <> Users, integrating the communication with Mobile devices (Tablets & Smart Phones).
CAPTURAS allows the companies to create connected car solutions for new mobility concepts, to explore new markets, develop business, and get access to new market shear. Further it provides innovative user experience, by simplifying accessibility, while it generates knowledge for mobility management to gain efficiency and sustainability.
CAPTURAs is the modular and customizable platform addressed to solve the next generation of mobility solutions required by the companies which develops it business in the Smart Mobility market.
Now a days CAPTURAS provides off the shelf solutions for:

- Vehicle keyless sharing 3.0.
- The next generation of in-vehicle infotainment.
- Advance fleet management system, for efficient management of mobility.

Status

OTC_Engineering are currently commercialize 3 off-the-shelf CAPTURAS solutions:

- Keyless sharing 3.0.
- The next infotainment generation.
- Logistics assistant manager 2.0.

Further, by suing CAPTURAS platform benefits, communication capabilities and modularity it provides some costumers with proprietary in-vehicle communication and telematic solutions.

Applications

Products and solutions for Smart Mobility, and new concepts of mobility.

- Keyless sharing 3.0.
- The next infotainment generation.
- Logistics assistant manager 2.0.

Potential cooperation partners / Customers

1. Companies targeted to Smart Mobility market, including OEM's and TIER's.
2. Companies which works on mobility management (traffic, fleets and logistics), and those which are exploring new mobility concepts.
3. Targeted market are: OEM's, Sharing, Corporative fleets, Rentals, Logistics and Liaising.

Inmensus: New variable geometry suspension system

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Technological description

It is a new variable geometry suspension system that improves dynamics of vehicles, safety and ecology. It is based on the TECNALIA patent PCT ES2008/000081.
The identified benefits are placed mainly in:

- Dynamics safety.
- Trajectory modification: ADAS system.
- Wheel and contact optimization: improving adherence.

Ecology:

- Reducing consume and emissions.
- Improving pneumatic behavior.
- Applicable in hybrid and electric vehicles which include high electric power buses.

The increasing electrification of vehicles and use of high voltage electric buses let the use of bigger electric actuators.
INTEK – BERRI 2009 – GAITEK.
Timing of the project: 3 years.
Coordinator: TECNALIA.

Status

A functional prototype is about to be finished in the next 3 months.

Applications

New hybrid and electric cars with completely new designed suspension system.
New buses and trucks.

Potential cooperation partners / Customers

Companies involved in suspension systems, which will be able to offer a new high value product, in relation with the present system that shows clear benefits to a new type of mainly hybrid and electric vehicles.

Electronics & Communications

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Technological description

TEKNIKER-IK4 develops solutions for power train distributed control, wired/wireless communications and gateways, wireless sensors and safety and vehicle dynamic active control:

- Reference platforms and ECUs model based development methodologies for drive train distributed control over FlexRay and AUTOSAR.
- Advanced digital processing for distributed drive train torque control (electronic differential & 4X4, Proactive Anti-Slip Regulation, Torque Vectoring, Electronic Stability Program, Electric Anti-lock System...).
- CAN, LIN, MOST, FlexRay and wireless communications technologies for electrical vehicles.
- Energy awareness and power harvesting for wireless sensors.

Status

Different prototypes have been developed and validated in the frame of R&D and industrial projects.

Applications

The results can be easily installed in real vehicles for demo purposes and also integrated for commercial product release.

Potential cooperation partners / Customers

Vehicle components manufacturers are cooperating with TEKNIKER-IK4 for the real integration of the proposed solutions into real solutions.

Advanced Driver Assistance Systems for EV (SOEKS & DDNA)

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Technological description

Artificial intelligence algorithms for modelling and enhancing EV operation. The approach is based on data and knowledge mining, semantic technologies, ontology modelling and query systems and in particular in the SOEKS (Set Of Experience Knowledge Structure) and the Decisional DNA (DDNA).
This proposed technology is used for: 1) Optimization of the EV according to the less-energy expended route; 2) Optimizations of the life span of the car battery and in general its autonomy; 3) In transit recommendations based on the vehicle geo position and requirements; 4) Efficiency enhancement in route planning; 5) EV electro-Mechanical systems adaptation according to road situation (brakes, shifts, hydraulics); 6) Under demand dynamic transport calculation; 7) Real Time Car sharing/pooling solutions.

Status

Currently the scientific design of algorithms is available, an API is in production and the application of this technology is in evaluation in recommendation systems.

Applications

The applications are mainly focused in the enhancement of the EV in the aspects of autonomy, safety, route planning and EV adaptation to terrain, by analyzing and acting accordingly to vast amount of variables that in real time the sensor system is acquiring while reacting to the supervised and unsupervised learning.
Non-intrusive recommendations provide the driver with real-time (adaptive) information about the status of the energy expenditure along with recommendations on the best practices. Contemporaneously, the system is able to collect in a centralized way the decisions made by expert users and then to re-use them by providing recommendations to sophomore drivers.

Potential cooperation partners / Customers

Car and vehicle manufacturers are indeed cooperating with Vicomtech-ik4 for the real integration of the proposed solutions. Public transport operators and administrations could be also benefited from this technology.

Advanced Driver Assistance Systems for EV (ADAS)

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Technological description

Vicomtech-IK4 develops solutions (services, application, sensors etc.) especially designed and adapted to existing EV (green car), elements to improve the autonomy, driving comfort and security for the user tailored to the situation.
Computer vision algorithms for the real-time modelling of the road surrounding a vehicle in which a single camera is installed. The methods are based on probabilistic inference to provide accurate, robust, and efficient estimations of the elements of interest. In the road scenario, the proposed technology is used to detect and track the lanes of the road, the vehicles ahead, the status of the driver by means of the 3D modelling of its face and the existence and type of traffic signs.

Status

Currently the scientific design of algorithms is completed and multiplatform real-time implementations are available. The results can be easily installed in real vehicles for demo purposes and also integrated for commercial product release.

Applications

The applications are mainly focused on providing the driver warnings and messages about the situation of the road around the vehicle. The range of services cover: cruise control, lane departure warning, obstacle detection, safety distance warning, drowsiness detection and warnings, traffic sign identification and notification, etc.

Potential cooperation partners / Customers

Car and vehicle manufacturers are indeed cooperating with Vicomtech-IK4 for the real integration of the proposed solutions into real solutions. Besides, bus operators or transport companies are customers of ADAS solutions.

Electric vehicles

AERC: All Electric Race Cars Development

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Technological description

The AERC (All Electric Race Cars) is a global project developed by Quimera company, with Altran as Global Technical Partner. This project has two main goals: to be living laboratory for electric technologies development and critical testing and to develop zero pollutant vehicles development for sustainable racing.
The first vehicle developed is the AEGT. The AEGT, already assembled and in test phase, has 500kW and a 0-100km/h acceleration in 3,5s. This GT1 class vehicle aims to show the feasibility of electric racing in similar or event best performances than combustion vehicles. Battery pack design and management, as well as the 3 PMSM machines coupling are the main challenges faced in this project. Evo2 version is already under development.
In parallel, two other projects are being developed: an electric version of the KTM X-Bow (GT4 class vehicle), with the challenge of battery integration is reduced space available, and the AEGF (All Electric Grand Formula), aiming to compete at the same performances as the F1 vehicles. Both projects are quite advanced in terms of engineering.


AEGT


AEGF

Status

The AEGT prototype is already developed and in test/optimization phase. Its Evo2 version is in the end of engineering phase and it will be produced for the end of 2012.
The AEGF concept engineering is in process. The expected date for production of the first prototype is early 2013.

Applications

- Sustainable racing: world racing championship based in electric vehicles.
- Electric technologies development for vehicle: using the vehicles as R&D platforms.

Potential cooperation partners / Customers

AERC global project is currently performed in partnership with Quimera company, and also collaborating with different companies as Sunred, KTM, Solution-F and electric technology suppliers. Companies/technical centres offering new electric technology solutions (new cells, materials, electric motors, safety solutions) can be potential partners, using the vehicles as R&D platform.

Industrial Trike for Urban Use

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Technological description

Evolo Evolving Mobility, S.L., is a company that develops solutions for urban mobility and logistics applications.
The C-EVOLO is an industrial trike for urban uses. It is a vehicle certified as electrical assisted bike. Several Spanish companies have trust Evolo Evolving Mobility, S.L., by using one of the two models already available in the market: C-EVOLO Freighter model and the C-EVOLO Rickshaw model. The former is an electric assisted trike for goods logistics, the latter is used as a cyclotaxi for people transportation.
The vehicles are built using metallic and composite parts. Both vehicles are equipped with a 250 watt electric motor and a Lifepo 16Ah battery. Evolo Evolving Mobility, S.L., is owner of the electronic algorithms that steer the electric system.

Status

The C-EVOLO Freighter models as well as the C-EVOLO Rickshaw are mature vehicle already available in the market. We have already developed a prototype of the solar vehicle model.

Applications

Thanks to the versatility of the tricycles, with the most ingenious and innovative tools, potential applications can be found in a broad range of market sectors:

- Transport and urban logistics.
- Environment.
- Tourism and culture.
- Health.
- Marketing and promotion.

Potential cooperation partners / Customers

Evolo Evolving Mobility S.L. is currently collaborating with several companies and research centers. New technologies for information and communication devices have been developed in collaboration with the TECDOA company. Besides a solar vehicles equipped with photovoltaic cells on the C-EVOLO trike have been developed in collaboration with TECNALIA.

CHISPA electric public cars

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Technological description

CHISPA electric public cars have a patented interconnecting and articulated chassis, that enables them to be distributed in compact car trains by a towing truck to places of demand. The system enables the creation of an efficient and reliable urban carsharing service at a third of the cost of existing services.

Status

- Fully patented vehicle design.
- Experimental prototype built 2011.
- Taking part in AVANZA iCOPILOT project, Spain.
- Project development expected to start 2014.
- Demo in La FIRA exhibition complex 2016.

Applications

The CHISPA project can provide a sustainable and affordable personal mobility in urban areas, a reponse to the pardigm shift from car ownership to carsharing. Supplying.

Potential cooperation partners / Customers

Partners:
- Little Electric Cars, Vigo.
- IXION Industry and Aerospace, Madrid.

Customers:
- Hospitalet de Llobregat town hall.
- La FIRA Exhibition complex.

HIRIKO

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Technological description

The Hiriko urban car is designed specifically for short intra-urban trips and to alleviate congestion, parking problems and tailpipe emissions in urban centers. Its radical design, which shifts the drive to the car's wheels, reduces its parking footprint. When parked it collapses to a third of the length of a conventional car, making it possible to fit three of them into a single parking space. Passengers can easily exit the car from the front using its retractable windshield. The back compartment provides generous storage space and is also easily accessible.
Unlike conventional vehicles, the Hiriko does not have a central engine or traditional power train but is powered by four in-wheel electric motors. Each wheel unit contains a drive motor (which also enables regenerative braking), steering and suspension and is independently digitally controlled. This means the vehicle can spin 360º on its own axis, move sideways into parallel parking spaces or change lanes moving sideways.
The Hiriko's innovative navigational systems include a "haptic" steering mechanism (a tactile feedback technology) that assists drivers and offers the possibility of electronically adjusting driving speeds to city limits. Its revolutionary ergonomics provide for a fully integrated sound system and a touch screen central console with instant access to practical urban information (e.g., nearest parking, best routes) and cultural and entertainment options via mobile phone and the Internet.

Status

The first prototypes are ready for homologation, and it has started the production of the pres-series and demo vehicles. HIRIKO will be commercially available on the second half of next year.

Applications

The world's cities are under pressure. With the urban population set to rise to 4.9 billion by 2030, the race is on to find ways to reduce their ecological footprint. The estimated one billion plus vehicles on the roads means city planners are looking for solutions to the widespread, chronic problems of urban congestion and pollution. The Hiriko Mobility Project, unveiled in Brussels in late January 2012, offers some hope of a way forward. The project is not only delivering the world's first sustainable urban vehicle, it also seeks to modify the mobility habits of city dwellers and to create opportunities for regional economic development.
The plan is to deploy the Hiriko with cities in car fleets and to lease them to city residents. A number of cities have already expressed interest in acquiring it, including Berlin, Malmö, Barcelona, San Francisco and Hong Kong. Talks are also under way with city authorities in Paris, London, Boston, Dubai and Brussels.

Potential cooperation partners / Customers

The HIRIKO city car was conceptualised by the Massachusetts Institute of Technology (MIT) Media Lab and developed by a consortium of seven firms in Spain's Basque region, namely, BRW-Basque Robot Wheels, Forging Products, Guardian, Ingeinnova, Maser Mic, Sapa and TMA. The project is being coordinated by the Denokinn Center (the Basque Centre for Social Innovation, Entrepreneurship and New Business Development) under the direction of AFYPAIDA, an association dedicated to promoting the Spanish auto industry.

Electric bus

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Technological description

Due to the experience obtained in several collaborative projects, the partners involved in the project INNELBUS (ERDF funded) are developing a high dimensions urban bus with pure electric powertrain. There are several technologies involved in the design of this vehicle, that is equipped with pure electric traction, through asynchronous PWM controlled motors and LiFePO4 batteries. Average power is 134 kW and range expected is 6 hours working under pure urban duty cycles. Of course, all systems are interconnected through CAN Bus (SAE J1939) to assure all quality levels. The chassis also has been designed under advance criteria to reduce weight, making it compatible with safety conditions.

Status

The consortium is currently preparing the prototype construction.

Applications

This project was planned taking into account an industrial demand from both urban buses manufacturers and public transport companies, who are looking for a solution to the environmental problem in our cities. Of course, a pure electric powertrain could be the best solution available for future transportation.

Potential cooperation partners / Customers

Customers:

- Public transport companies (city transport).

Potential cooperation partners:

- Public transport companies.
- Electric powertrain manufacturers.
- Batteries manufacturers.
- Powertrain engineering.
- R&D Automotive Institutions.
- Universities.

Light duty serial hybrid vehicle

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Technological description

The main goal of the Project is to develop a light duty serial hybrid vehicle from a preexisting platform, taking into account both powertrain technologies and structural and safety issues such as:

- Asynchronous PWM controlled motors, for pure electric traction.
- ICE-Synchronous generator unit, to get an extended range.
- Li-ion batteries power pack.
- Electronic control, through CAN Bus (SAE J1939).
- Optimization algorithms adjustable for every customer.
- Electric ground watchdog.
- Optimized structural design to get the best solution under mass criteria.
- Etc.

All these technologies are going to be implemented on the vehicle to get an efficient alternative transport product. It is intended to get an innovative product capable of satisfy all needs of potential customers through flexibility and profitability.

Status

The project is at design step.

Applications

The product is oriented to maintenance teams, forest surveillance, emergencies and all tasks in which currently are been used off-road vehicles, but powered with a powertrain environmental friendly, with very high torque from starting and with a standard range.

Potential cooperation partners / Customers

- Public administrations.
- Private companies.
- Electric powertrain manufacturers.
- Batteries manufacturers.
- Powertrain engineering.
- R&D Automotive Institutions.
- Universities.

eMoTria, 3 wheel passenger urban utility cross-over

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Technological description

An innovative architectural concept in light vehicles is unveiled with this unique style 3 wheel cross over.
Its technology combines: industrial design, electro mobility, proprietary battery swap, unique front wheel 3 phase in-wheel motor, front wheel drive, aeronautics inspired quick anchorage, integrated tracking system, ECU electronic communication unit for electric and electronic control.
The vehicle is a passenger or cargo cross-over bridging the gap from a micro car and maxi scooter. Its 1 meter wide body makes it unique in crowded areas offering better stability and payload and volume capacity compared to bikes or motorbikes.
The body can be changed in less than a minute from an open passenger 3 wheels motorcycle into a micro van or a cabin for challenging weather conditions.
The batteries can be changed or charged.

Status

The concept prototype won a prize in the 2009 Barcelona Auto Show and was exhibited in specific fairs.
The engineering and technology deployment was exposed in the 2011 EAEC congress.
Pre-series prototype was built and tested.
The same vehicle exceeded homologation tests as European class L2e and is ready for a first short run production designated to usability tests in real use.
Some chassis are already manufactured; specific designed components are ready to start production.

Applications

Passenger, personal transportation, car share fleets, delivery, urban services, light cargo, security patrol, gardening, camping and eco garbage picking.
Robustness and no autonomy limitation allow 24/7.
Quick body configuration change system allows the same vehicle be used for a wide range of tasks.

Potential cooperation partners / Customers

VELMUS IDI invites RTDs, big corporations and government agencies to make joint developments to fit special needs. The vehicle is already prepared and homologated to receive different body applications such as roofs, cargo boxes or open trays instead of a 2nd passenger seat.
The manufacturing process let us tailor finishing and design and development of special body applications.
The vehicle can be connected to the client's V2G network using our communication device or following customer's one.
Vehicle set-up can be run at customer's facilities or can be sent with a turnkey integrated fleet solution under customer's project drives.

ZYTEL. Electric vehicles

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Technological description

The Zytel Zero is a vehicle based on compact design and is well suited to many users looking for environmental benefits whilst cutting operational costs associated with traditional vehicles.
It is an electrical car that has the capacity of deliver the same range that a conventional one, only with electrical energy as its power source.
The Zytel Zero delivers a quiet and comfortable monitoring experience with a single charge. This gives it a range that is ample for everyday.
For charging is connected to a standard 120, 230 or 400 volt domestic outlet using the charging cables supplied with the vehicle. Besides it is possible work with either 50 Hz or 60 Hz.

Status

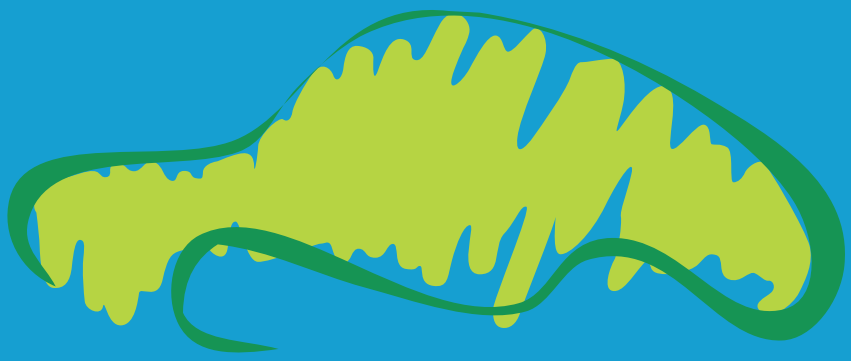
This vehicle is high performance prototype. The production is expected to start in next months. This car has been developed on demand, and fit the characteristic depending on the end use of the car.

Applications

Because of the high battery load, this vehicle can be used mainly to transport people large distances.

Potential cooperation partners / Customers

Logistics vehicle fleets.
Customized electric vehicles.
Integrated electrification systems.



Materials, production systems, ecodesing, recycling

"ECO-Technologies" for the main components in Green Cars

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Technological description

A re-design of current technologies in charging points, brake systems, converters, air conditioning systems, auxiliary systems powered by renewable energy and batteries, some of the main components of electric vehicles, is possible including innovation and an environmental point of view. A change from each one's reference technology has already been proposed using Eco-design methodology. Starting from these results, it is possible to probe that the carbon footprint is less in new eco-redesigned technologies and based on simulations, conclusions for manufacturers can be established. The alternatives have been compared by means of the methodology of Life Cycle Assessment (LCA), following the international standards ISO 14040 and ISO 14006. The research to look for eco-technologies in electric vehicles has been carried out in the framework of the project GREEN-CAR ECO-DESIGN (funded by ERDF through the Territorial Cooperation Programme for the Southwest European Area —INTERREG IVB SUDOE—, with reference number SOE2/P1/E326).

Status

Once compiled their life cycle inventories, virtual simulations of these technologies have been created in software SimaPro® 7.3, providing complete information about them. A comparative study of the results in both simulations (initial and eco-redesigned technologies) has been carried out. With all these outcomes, a list of environmental impacts caused by the main components of electric vehicles in their life cycle has been elaborated. This multi-view approach makes easier to set strategies aimed at achieving sustainable development.

Applications

The simulations of the eco-redesigned technologies allow to detail the environmental profile of selected technologies in electric vehicles, identifying which elements in their life cycle produce more environmental impacts. By this way, manufacturers will be able to design the components taking into account the environment and consequently, to reduce environmental impacts throughout their life cycle integrating eco-efficiency. In other words, the project helps electric vehicles to achieve simultaneously the goals of cost, quality and performance reducing cradle to grave environmental impacts.

Potential cooperation partners / Customers

Using an Eco-design methodology, the automotive industry will provide added value to their products since they can be recognized as produced with less environmental impact and less harmful to the environment during their lifetime.
The actions developed in the project are aimed at raising awareness of the application of the methodologies of eco-design, showing the relationship between this tool and innovation in the changing sector of vehicles manufacturing, especially nowadays due to the emerging electric mobility.

Stages Molding: A new technology for the production of light weight plastic parts

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Technological description

Stages Molding is a novel technology to produce plastic parts. The technology allows producing plastic parts with reduced weight, complex shapes, from a variety of polymers, with excellent surface quality and reduced internal stresses. This novel process uses cheaper molds and equipments than those used in injection molding, therefore cost reductions are also obtained. These specific characteristics make this technology very promising for the production of plastic parts for different markets.
In particular, stages molding is a very promising technology for the automotive sector due to the significant weight reduction (higher than 50%) that is possible to achieve. Stages molding has been introduced in the FP7 project recently approved "EVOLUTION" to produce light weight part for electrical vehicles.

Status

The patented technology by the company ABN Group and the CellMat Laboratory of the University of Valladolid is available for demonstration. It has been field tested for different parts and it already has several real applications.

Applications

The technology allows producing plastic parts with the following characteristics:

Density range of the parts produced	a) Solid parts b) Density reduced parts (weight reductions up to 98%) c) Structural parts
Possible polymers	Polyolefins, PVC, polystyrene, etc.
Fillers and maximum content	Any type. Maximum amount is 80%
Closing pressures	Below 15 bar
Cycle times	Adjustable
Parts size	3000 x 2000 x120 mm^3

Table 1: Principal characteristics of the technology.

The parts produced can be used in a variety of industrial sectors including the automotive one.

Potential cooperation partners / Customers

- Companies producing parts for cars and/or electrical parts.
- Cars manufacturing companies interested in new technologies able to reduce weight and cost in a significant weight without scarifying properties.
- Companies producing plastic parts and looking for technologies offering the following advantages: weight reduction, production of large plastic parts, cost reduction, production of short series, foamed products.

Steel Thixoforging

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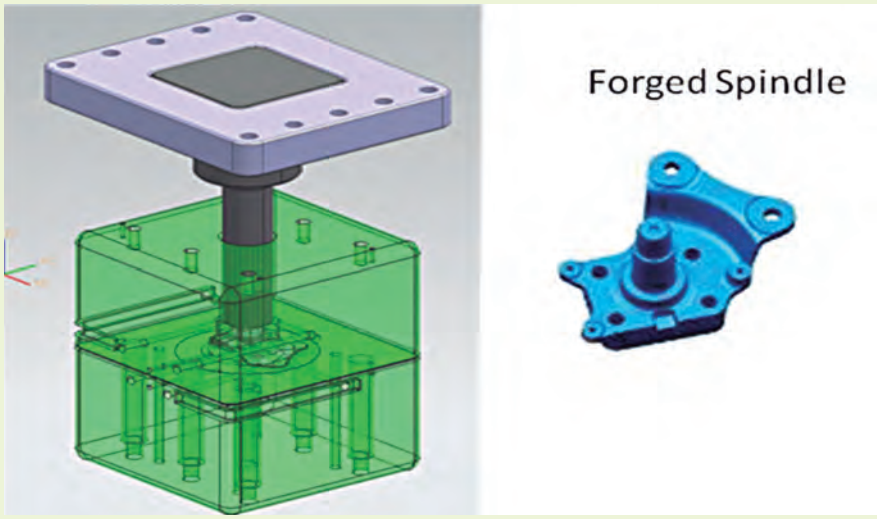
Technological description

Thixoforging is basically a forging process with the raw material in semi solid status. The viscous material status allows large deformations with smaller process forces. In our case, we are working with steel forgings.
The objective is to manufacture components with high mechanical requirements, with complex geometries and near net shape finishing.



We are working with a rear spindle forged in just one stroke and without any flush. The raw/net weight ratio is optimal.

Status

1st Prototypes made and optimizing materials for a 2nd batch of prototypes.

Applications

Forgings in general but especially for Complex forged parts and/or components with high scrap percentage (raw/net weight ratio).

Partners

CIE Automotive & Mondragón Unibertsitatea.

Full Life Cycle of Polymers & Composites in Electric Vehicles

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Technological description

GAIKER-IK4 develops solutions (Eco-design, polymer materials and composites, recycling processes and materials based on recycled polymers). Lab facilities for spray painting and testing the mechanical, chemical and fire materials conditions.
DEVELOPMENT OF MATERIALS, PASSIVE AND ACTIVE FOR COMFORT AND SAFETY BASED ON THE IMPROVEMENT OF THERMOPLASTICS AND THERMOSET RESINS SYSTEMS.

- High impact absorption materials, thermal and acoustical insulation materials.
- Thermochromic, antiscratching, antifouling, self cleaning surfaces.
- Lightweight polymers Long-fibre reinforced composites. Halogen free ignifugation.

PROCESSING OF POLYMER AND MATRIX COMPOSITES:

- PROCESSES (RTM, Vacuum molding/Infusion, Pultrussion, SMC/BMC, RTM, Compression, Injection, Thermoconforming, Extrusion, Robot painting, coating systems).
- RADIATION CURING SYSTEMS (UV, MW, IR).

SUSTAINABLE DESING AND RECYCLING:

- Eco-design of polymer and composite containing parts, assemblies and products using environmental assessment tools, together with Simulation for modeling environmental aspects during the all product life.
- Sorting and Separation of valuable fractions from ELV by means of automatic identification and physical separation operations.

Summarizing, GAIKER-IK4's main technologies are: Polymers materials, coating and composites development and processing technologies.

Status

The results can be prototyped for demo purposes and also integrated for commercial product release.

Applications

The applications are mainly focused in the polymer components of electrical vehicles. It covers all life cycle of these materials by applying sustainability concepts for design, and developing new coating and functional polymers and composites.
In Vehicle esthetic elements:

- New Coating and materials (natural materials, textures, active materials,...).

In Vehicle mechanical and structural parts:

- Fibber Metal Laminates and Light Composites and Thermoplastics tapes...
- Active polymer materials (semiconductor,...).
- Radiation base curing Technologies for cost reduction.

Potential cooperation partners / Customers

Vehicle manufacturers and suppliers, polymer recycling companies are already cooperating with GAIKER-ik4. Coating developers and users, together with polymers parts suppliers are our target collaborators for industrial applications.

Lightweight and multifunctional materials

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Technological description

Applied research services to the industry for the development of innovative products and processes based on the appropriate selection of materials and a deep knowledge of their functional properties, including the development of new advanced and multifunctional materials:

- Behaviour modelling, life prediction and materials failure analysis under service conditions: advanced characterization and formulation of physical laws and models of macroscopic behaviour and failure of materials widely used in the automotive sector.
- Applied multiscale modelling: integration of different multiscale modelling approaches mainly related to prediction and understanding of relationships process-product, linking micro and sub-micro phenomena in the materials structure to the final functional behaviour.
- Development of advanced performance composites and multifunctional nanocomposites: modelling, design and manufacture of polymer matrix composites, from light weight composite structures to advanced multifunctional nanocomposites.
- Structural integrity: advanced structural analysis in combination with structural monitoring and application of optimisation techniques for mechanical design.

Status

Generation and development of high-end activities focused on the numerical characterization and prediction of the behaviour of materials and design of multifunctional materials. Successful cases in body parts, chassis and drivetrain components and systems.

Applications

Weight reduction of components and multimaterial structures:

- Advanced material characterization and formulation of physical laws. Development of macroscopic behaviour models (non-linearity, visco-elasticity, fatigue life prediction).
- Computational simulation: virtual prototyping of parts and systems through advanced using of FEA, CFD and Fluid-Solid-Interaction tools, modelling of material processes, dynamic phenomena, fluid-solid interaction, etc.
- Research on joining technologies, with special focus on characterisation and modelling of adhesives, and development of numerical models for mechanical fasteners (bolts, rivets, etc.).
- Design, simulation, manufacturing and testing of composite parts and structures, including NDT inspection using active thermography.

Tailored-multifunctional materials:

- Modelling, design and manufacture of new polymer matrix nanoreinforced materials with knowledge-based multifunctional performance for obtaining new properties in relation to magnetism, EMI shielding, electrical conductivity, etc.

Potential cooperation partners / Customers

- Companies (OEM's, Tier1 and Tier2) to collaborate in the D&D of new products, components or systems, considering materials performance as a key factor.
- Partners to participate in national and European public funding projects.

Lightweighting by Multimaterial assembly

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IK4 Research Alliance

Technological description

Lightweighting is an important aspect for efficient use of electric vehicles. Nowadays, batteries themselves impose an important penalty in weight so, any extra weight in the car body, involves extra power system with extra battery use, with the double increase in weight and battery related costs. Some of the key elements and capabilities developed by IK4 LORTEK include:

- Clean, fume free welding technologies for light metals.
- New assembly and novel joining techniques for multimaterial designs (metal, polymer, composites, foams, laminar multimaterials...), both for car body, car components and battery fabrication.
- Optimised body structures, with a trade off between safety and weight. Design and joining selection capabilities based on simulations.
- Industrialisation of assembly for small-medium batch production; not covered by nowadays mass production techniques.
- Defect free and highly reliable manufacturing.

In summary: our main technologies are related to: manufacturing and assembly, service driven material design optimization, production technologies.

Status

Several prototype configurations have been developed by IK4-LORTEK which combine different materials representative of potential materials for the car body, in the frame of R&D projects (INTEGRAUTO, FLEXYWELD, SPOTLIGHT, DISTRUCTURE). Different project initiatives related to the topic have been submitted under the umbrella of the FP7 Programme; which deal with the subject focused on electric urban cars; taking into account the peculiarities of these cars.
Current knowledge and in house equipment make possible the set up of a demo production plant for parts assembly, based on the developed techniques.

Applications

The available expertise and technologies are directly addressed to, among others, the following applications:

- Full-electric vehicles, intensive in multilateral combinations, from the battery (large number of connections) to car's body, through engine and vehicle parts components.
- New urban car production assembly techniques based on delocalised medium batch assembly production lines.

Potential cooperation partners / Customers

Smart Cities and urban mobility managers, lightweight car body manufacturing (OEM-s, TIER1).

Materials

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Technological description

TEKNIKER-IK4 has a large experience in the development of materials and coatings for vehicles components height reduction, corrosion protection, wear reduction and performance optimisation:

- Development of fireproof materials and anti-corrosive coatings for batteries.
- Development of coating with sensor properties, predictive maintenance, monitoring systems and diagnostics.
- Eco-friendly lubricants.
- Accelerated life test for batteries.
- Optical fiber sensor for battery monitoring.
- Light materials (Al, Mg, Ti.) and coatings (Plasma Electro Oxidation, PVD).
- Lithium-based Ionic Liquids.
- Toxicity and leachate tests for batteries.
- Accelerated wear tests of engine components.
- Accelerated corrosion tests of engine components.

Status

Different prototypes have been developed and validated in the frame of R&D projects.

Applications

The results can be easily installed in real vehicles components for demo/homologation purposes.

Potential cooperation partners / Customers

Car and vehicle components manufacturers are cooperating with TEKNIKER-IK4 for the real integration of the proposed solutions into real solutions.

OPTIBODY-Helping to modularise new Electric Light Trucks and Vans (ELTVs)

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Technological description

OPTIBODY will develop a new concept of modular structural architecture for electric light trucks and vans implementing new concepts entirely acceptable by large manufacturers. It means that all the major European automotive industries will be able to take advantage of these new concepts that will be applicable to other kind of vehicles where electrification could lead to new structural architectures.
Thus, OPTIBODY can be considered as a label design. If a new vehicle concept is given this label, it means that the vehicle meets some basic requirements for modularity, repairability and safety.

Status

Currently, the project is in its main phase of technical development; with its initial phase of analysing and compiling information just concluded and now starting the design of the OPTIBODY concepts and parts.
Besides, OPTIBODY suggests the creation of High Level Advisory Boards formed by people linked to Institutions, who can value and express their opinion about the quality of the specific Project achievements.

Applications

Preliminary definition of a new kind of standard applicable to modular EV vehicles.

Potential cooperation partners / Customers

All the organisations in any of the phases of design and manufacture of EVs.
The fact of the modularity of these new architectures represents a market opportunity not only for large vehicle manufacturers, but also for SMEs and component manufacturers in order to allow them to offer their own proposals to Light Trucks and Vans assemblers.

Charging infrastructure

P024 Mugielec PT3 ecopx hybrid system for charging points and comm nodes supplying

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Technological description

The (P024 PT3) ECOPX System is a compact, cheap, easy to operate, and reliable solution for those applications where a green but also secure solution for powering certain loads (as ELECTRICAL Vehicle charging points or communication nodes) is demanded. The ECOPX system is comprised by a single cabinet which handles different energy sources (right now solar and conventional mains but also expandable to wind power and GenSet sources), prioritizing the renewable ones but using conventional ones in case the green ones are not available or are not enough to supply to the loads.
A single supervision unit manages the whole modular input system (output is managed by a second supervision unit only if 230Vac are required), establishing the most cost effective mix of energies. It also switches on/off the most suitable number of rectifiers to allow the system working in the upper zone of the efficiency curve. Other operation modes, like cycling of the modules (to ensure a balanced distribution of the running hours among all the rectifier modules), ensure a high efficiency and reliability for the system.
Just in case of short interruptions of the mains when there is no green energy available, the system is backup by a NiCd free of maintenance battery which assures that no "0" are going to be seen in the load side. The output can be either 24Vdc or 230Vac and the Max power is limited right now to up to 4.8kW (having a redundant module of up to 1.6 kW).
System is based in Telecom technology, well proven and reliable, highly efficient (up to 96%) and strong to severe environmental and electromagnetic conditions. It can be easily remotely operated and it is maintenance free. Moreover, a redundancy in each system (rectifier and inverters) can be easily added. Indoor and outdoor cabinets can be provided.

Status

The system is right now under final development for the low speed charging point power unit but it is actually operative in some places as communication nodes powering system. A demo system will be available for Parking Areas before end of the year (November 2012).

Applications

Ecological power supply for charging the Electrical Vehicles. Suitable when a secure and reliable system is needed for keeping the battery of the vehicles charged at any time independently of the availability of renewable energy but prioritizing the green energies. Some other consumptions, which allow good power quality supply (no interruptions, no distortions), as pricing and control system could also be backup by a branch of the outlet. It also can supply energy to communications modes as the ones used to link different parkings or e-substations with a central node.

Potential cooperation partners / Customers

Nowadays, AEG-PS is developing this system under the scope of the MUGIELEC EV infrastructure developer consortium, comprised by several companies around electrical and R+D business in Basque Country as: Iberdrola, Ormazabal, Fagor, Gamesa, ZIV, Tecnalia... The PS+BS program system, leaded by AEG PS-ZIV and Incoesa is one of the work packets, called PT3.
Customers related to EV Business would be e-substation operators, public, companies or private parking owners, or even, telecom companies (communications nodes operators),

P024 Mugielec PT2 peak saving + battery storage system

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Technological description

The (P024 PT2) PS+BS System is a compact, cheap, easy to operate, and reliable solution for those applications where peak power demands (limited in duration and frequency) force operators to contract with E-Utilities a higher (an more expensive), than needed, electrical power. The AEG's PS+BS system allows a flattened power demand curve by means of a current injection into the internal grid; energy that has previously being stored.
A second target is related to the fact energy prices are related to e-power consumption intervals. Having the possibility of storing the energy by means of electrochemical accumulators (batteries), the user would save money charging the batteries when the kWh price is on the bottom of the price curve and supplying it when the price is higher.
Our system is composed by a Battery Charger, a large TGel Maintenance Free Pb Acid battery, a Battery Monitoring System (BMS) and a variable number of inverters for current injection. An interface gateway included in the scope of delivery, allows the connection by ModBus TPC standard, of the PPS+BS system with a centralized and fully programmable control system named SIA, which establishes the best time to charge or to inject. This SIA supervision and control unit is being developed jointly by ORMAZABAL and Tecnalia companies. The whole system can also be placed into a concrete shelter for easy transportation.
Different powers and autonomies are available, depending on customer`s requirements. Nowadays, the demo system delivers up to 60 kW (powers up to 500 kW will be also available) and autonomies of h at full power injection.
Control system provides different options for setting up the system allowing the operator to configure and operate the system under different scenarios and operation rules. Remote controlling and monitoring is therefore allowed, avoiding operator presence.

Status

The system is right now under commissioning in our factory. Integration of it, with the SIA Control and having the complete system assembled into a concrete shelter is expected for July'12.

Applications

Peak saving and energy storage system for transformation centres in e-stations (Electrical Vehicle Infrastructure). It could, also, be placed wherever a smoothing of the power consumption could be necessary (factories, little renewable solar or wind farms, etc.). The savings, in terms of lowering the "contracted" power rate with the electricity distributor (e-utility), and the balance between stored/injected energy kWh prices can be easily calculated.

Potential cooperation partners / Customers

Nowadays, AEG-PS is developing this system under the scope of the MUGIELEC EV infrastructure developer consortium, comprised by several companies around electrical and R+D business in Basque Country as: Iberdrola, Ormazabal, Fagor, Gamesa, ZIV, Tecnalia... The PS+BS program system, leaded by AEG PS-Tecnalia and Ormazabal is one of the work packets, called PT2.
Customers related to EV Business would be e-substation operators.

Crave Charging Management System

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CRAVE CMS

Technological description

CRAVE CMS is a Electric Vehicle Supplier Equipment Charging Management System.
CRAVE CMS is a back end system designed for remote managing of new technology electric vehicle recharging infrastructure. This system has several benefits:

- Easy remote operation and monitoring.
- Flexible configuration of the main parameters including HMI.
- Standard operation of the EVSE transparent to the recharging technology thanks to the CSS, CRAVE SmartBox Subsystem that act as Control unit locally allocated inside each EVSE.
- Integrate fast charge functionalities as well as V2G and Decoupling system – B2G new functionalities.
- Possibility to run predictive maintenance routines remotely.

Main Functionalities:

- Display EVSE features and locations.
- Access to the EVSE data on real time.
- Remote Management of EVSE operation main parameters.
- Access to the use statistics of the EVSE.
- Access to the use statistics of the RFID user cards.
- Display of EVSE events.
- Access Permissions Management EVSE Technical features.
- Isolated EVSE management available.
- EVSE alarms monitor.

Status

CRAVE system is already online for CHAdeMO chargers, fast and V2G.

Applications

- Server maintenance.
- Services support for commissioning.
- Definition of access permissions by chargers.
- User cards management.
- Remote support for tests or maintenance.
- Equipment settings changes online.
- Alarms management and incidences communication.
- Development of statistic reports.

Potential cooperation partners / Customers

Smartbox integration with other CMSs.

FASTO WIRELESS 60. Inductive Charge Technologies

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FASTO WIRELESS 60

Technological description

FASTO WIRELESS 60 is an inductive charging station with a maximum power of 60 kW.
The installation is fast and recommendable to all environments due to its design.
FASTO WIRELESS 60 station is a contactless technology conceived to provide energy without plugging any cable. This system has several benefits:

- Easily operated and comfortable due to the automation of the charging process.
- Flexible as is integrated with modules of 30 kW therefore it is easy to increase the maximum power adding new ones.
- Safe against vandalism due to all devices are encapsulated into the vehicle and the ground.
- Works in a range of adverse environments including extremes temperatures, submerged in water or covered in ice and snow.
- Allows elimination of overhead wires increasing a city's attractiveness.

Main Features:

- 15-30 minutes to charge.
- Communications with local/remote management systems.
- Electric Mobility systems Integration.
- Easy Installation and Maintenance.
- Future upgrade possibility.
- Remote upgradability.
- European regulation and certification compliance. CE mark.

Status

Up to now, it is on prototype and demos.

Applications

- Private environments with public use (petrol stations, EV parking lot, Major retailers, etc.).
- Vehicle fleets.
- Public transports.

Potential cooperation partners / Customers

- Public transport companies.

V2G Charge Technologies. V2G5

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Technological description

V2G 5 is an electric vehicle charging and discharging equipment with 5kW DC power.
The installation is fast and recommendable to all environments due to its design.
V2G 5 charging equipment is based on CHAdeMO protocol. It's conceived to provide energy to the vehicles and supply energy to the grid or to the house, requiring to its installation reduced civil works.
Its simple human interface simplify the interaction between the infrastructure, improving the usability of V2G 5.
In addition the equipment has the possibility to be managed remotely and integrated into e-mobility systems regarding different contexts and business models.
All this features along with international standards compliance makes V2G 5 an absolutely suitable product to any environment.
Main Features:

- Communications with local/remote management systems.
- Electric Mobility systems Integration.
- Easy Installation and fast Maintenance.
- Future upgrade capabilities.
- Remote upgradability.
- European regulation and certification compliance. CE mark.

V2G 5 basic:

- CHAdeMO charging standard.
- CHAdeMO draft discharging standard.
- RFID Identification System.
- Human Interface.
- Max Charging/discharge Power 5 kW, 20A DC.
- Grid connection 230V AC.

Status

There are already 6 V2G chargers operative in Malaga city since April 2013.

Applications

- Private environments with public use.
- Vehicle fleets.
- Private users.

Charging station and parking meter

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Technological description

This totally new hybrid is equipped with two standard connector types for recharging the most common electrical vehicles on the marketplace, namely Domestic Type (Schuko) and Type 2 connectors.
Technical file:

- Two connectors for charging electric vehicles.
- Reliable and cost-effective: low maintenance and consumption.
- Versatile with modular architecture and configured for multiple languages, currencies, rates and scheduling.
- Accessible and ergonomic: adapted for persons with reduced mobility, multimedia display, intuitive and interactive.

Status

A first prototype was manufactured and we are now developing two new prototypes with different functionalities to be included in the stand of Gamesa Electric at EVS27. We estimate a normal production of this hybrid new product during 2014.

Applications

Our cities are currently populated with parking meters and other elements that create obstacles for mobility on public roads. Moreover, the target for 2020 envisions each European country having numerous electric vehicle charging stations. According to the European Directive of January 2013, Spain will have 82,400 public charging stations.
Gamesa Electric has been committed to a hybrid product that integrates electric charging station and parking meter. This hybrid will help reduce additional elements along the cityscape while creating less obstacles on public roads.
The ability to combine a parking meter with a charging station to form a single product instead of having two separate components ultimately means more free space in addition to the noteworthy economic savings, since civil engineering work would only be needed for one spot instead of two, equipped with a single cover and sole electrical installation. This combination product also reduces certain components because it comprises common parts for both applications: charging station and parking meter.

Potential cooperation partners / Customers

Our partner is a company that manufacture parking meters and is internationally known, Meypar.
Our potential clients are cities with the management service by metered parking spaces and interested in starting to implement green mobility in their current traffic.

Everflash 502A: EV fast DC and AC charging point

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Technological description

EVERFLASH is a 50kW ultra-fast DC and up to 22kW AC fast charger whose flexible configuration allows the charge of every electric vehicle in the market. It supports CCS (EN61851-23 / DIN 70121) & CHAdeMO protocols for DC fast charging and also fast AC charging (IEC61851-1:2010), making it the perfect alternative for all customer needs.
In was developed in the context of the SURTIDOR, SIRENA and EU-CHARGE projects.
The main benefits provided by EVERFLASH 502A are:

- Very short charging times, typically between 15 and 30 minutes.
- Weather-resistant thanks to a high quality stainless steel cabinet.
- Very easy and inexpensive maintenance due to the separation of the cooling system from the power electronics section. No air filters needed (GH patented).
- Very low noise levels, almost inaudible charging session.
- A robust vandal-proof color display.

Status

EVERFLASH 502A will be on sale from the first week of November 2013.

Applications

EVERFLASH is the ideal solution for electric vehicle users, electrical utilities, fleet operators and future petrol stations when a fast charging is required, because it offers the shortest charging times.

Potential cooperation partners / Customers

Potential partners: energy companies, electrical utilities, engineering services involved in EV infrastructure, electric mobility operators.
Potential customers: energy companies, electrical utilities, fleet operators, municipalities, EV manufacturers.

Electric Vehicle Charging Infrastructure

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INABENSA

Technological description

Integrated EV charging infrastructure device including the following technologies:

- Energy storage:
  - Impedance Spectroscopy.
  - Electrochemical Characterization Batteries.
- Information and Communication Technologies:
  - Vehicle-to-Grid Technology. V2G.
- Charging Infrastructure:
  - Development of charging infrastructure for two-wheels vehicles based on modular batteries.
  - Wireless charging infrastructure based on induction technology.
  - Implementation of energy storage system in charging infrastructure devices.
- Energy Management:
  - New Business Models Development.
  - Software Development.

Status

Inabensa is working in the integration of all the technologies mentioned above in a unique system, obtaining in this way, an integrated charging infrastructure device.
The charging infrastructure for modular batteries, in line with the EMIC system, is going to be presented in June 2012.

Applications

The integrated charging infrastructure is specially conceived for the new concept of smart grid that is rising stronger every day.
Furthermore, the charging infrastructure for modular batteries and the associated EMIC system could be applied in new mobility concepts and sectors (yachting, aeronautical, aerospacial, agriculture...).

Potential cooperation partners / Customers

- Battery Manufacturers.
- Institutes, Universities or Public Organizations with high technological component.
- SME specialized in power electronics and/or ICTs.

IngeRev®Road: EV rapid charging point based on the CHAdeMO industrial standard

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Technological description

In the context of MUGIELEC, a project bringing together the main stakeholders in the electrical sector of the Basque Country, INGETEAM and TECNALIA have jointly developed the technology required to perform electric vehicle rapid charging, which will be implemented in the IngeRev® Road, the new member of the product family for EV charging by INGETEAM.
This product is fully compliant to the IEC 61851 mode 4 and to the international CHAdeMO standard (www.chademo.com), promoted by Tokyo Electric Power Company, Nissan Motor Company, Mitsubishi Motors Corporation, Toyota Motor Corporation y Fuji Heavy Industries Ltd.
IngeRev® Road rapid charging will make it possible to reduce charging times by more than 90%. For a run-time of approximately 100 Kms, it will take just 20 minutes to charge the vehicle compared to the 5 hours required for charging with the systems currently available.

Status

First IngeRev®Road prototype unveiled in Madrid in May 2012.
Currently undergoing certification tests.
First units are set to go on sale in early autumn 2012.
Mass production expected by Q1 2013.

Applications

IngeRev® Road units are initially set to be installed in those places with a high density of traffic, and also in strategic locations, thereby promoting the increased use of electric vehicles by offering enhanced charging possibilities for extended battery run-time.
The IngeRev® Road units can be installed indoor or outdoor, and have been designed according the CHAdeMO standard, thus being compatible with all vehicles also compatible with this standard, among them Nissan Leaf, Mitsubishi I-Miev, Peugeot iOn, Citroën C_Zero, etc. These units have been designed to fulfil the most demanding safety requirements, yet being simple to operate by a non skilled user.
The working principle is that the IngeRev® Road units are connected to the mains at low voltage (400 V three phases), and they contain the power electronics needed to rectify the alternating voltage into a source of direct current that is later injected in the vehicle. The vehicle communicates via CAN bus with the charging station, and sets the current demanded by the vehicle BMS, in order to charge the battery as fast as possible without damaging it.

Potential cooperation partners / Customers

IngeRev®Road has been developed thanks to the fruitful cooperation between INGETEAM (charging point design and implementation) and TECNALIA (SW development for CHAdeMO communication protocol between vehicle and charge point).
Customers: Energy companies, utilities, municipalities, public transportation companies, electric vehicle manufactures (cars and buses).

Development of Lithium Air Novel Materials for Electrical Vehicles

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Technological description

Fluctuation of oil prices and effects of global warming have forced us to look for the alternative energy storage and conversion systems, such as the smart grid. The maximum energy density of current lithium-ion batteries (LIB) is limited because of the intercalation chemistry of each electrode. Then, actual LIBs are not satisfactory for the practical application of electric vehicles (EV). Therefore metal-air batteries have attracted much attention as a possible alternative, especially for the replacing of diesel or gasoline, because of their energy density that is extremely high compared to that of other rechargeable batteries [1]. This technology leads to a very light dispositive where the limited intercalation chemistry is avoided. Li-air batteries are suitable for the development of the new generation of EV. It is estimated that a well optimized Li-air battery can yield a specific energy of up to 3000 Wh/Kg, over a factor of 15 greater than the state of the art lithium ion batteries [2]. Electrical cars today can typically travel only about 150 km on current LIB technology. The development of the lithium air batteries stands chance of being light enough to travel 800 km on a single charge and cheap enough to be practical for a typical family car. This problem is creating a significant barrier to electric vehicle adoption [3]. However, the impact of this technology has so far fallen short of its potential due to several daunting challenges which must be overcome as the cyclability or the wide gap between the practical (362 Wh/kg) and the theoretical (11 kWh/g) values of the specific energy [4].
In this project, a multidisciplinary expert work team in materials synthesis and characterisation, cells assembling and test will cooperate to carry out a joint research with the aim to develop innovative materials and technologies for EVs with the best performances and the lowest possible cost. This project contains innovations in term of the choice of materials but also regarding the processes of preparation used; (i) New nanostructured anodes are prepared from electrochemical deposition on specific template (e.g. nanorods or nanofibers). (ii) Membranes for the protection of lithium are prepared by electrospinning (iii) Cathode are elaborated from activated carbon with a specific porosity. The assembly of batteries cells for the integration in an electrical vehicle and life cycle assessment are also involved in this project.

Status

Prototype at laboratory scale is under investigation in term of synthesis of material (i.e. lithium anode, carbon air cathode and electrolyte) and in term of electrochemical characterisations.

Applications

Full Electrical Vehicles (FEV) is consisting with no doubt to the major application of this new technology.

Potential cooperation partners / Customers

Private or public companies in the field of the car industry or smaller vehicles (e.g. scooter).

[1] Kraytsberg A., Ein-Eli Y *J. Power Sources* 196 (2011) 886 - 893.
[2] Kumar B. et al., J. *Electrochem. Soc.* 157 (2010) A50 - A54.
[3] http://www.ibm.com/smarterplanet/us/en/smart_grid/article/battery500.html
[4] Zhang, J.-G. et al. J. *Power Sources* 195 (2010) 4332 - 4337.

IPT Inductive Power Transfer

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Technological description

It deals with a innovative technology regarding a rapid vehicle-charging infrastructure.
A wireless transfer power equipment to provide an appealing electrical charging network.
Characteristics:

- Fast electrical battery charge.
- Removal of the visual contamination.
- Energy exchange in motion. Not stop is necessary to refuel.
- Connectors are no more needed, so no mechanical wear nor oxidation is involved.
- Anti-vandalism system: both, transmitter and receiver are perfectly sealed.
- Secure system: both, transmitter and receiver are safety sealed, so electrocution is not possible.

Status

Prototype.

Applications

Electric buses recharging in urban areas whose layout counts with several bus stops.

Potential cooperation partners / Customers

Bus manufacturer.

SUMOSU STATIONS

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Technological description

SUMOSU Stations support sustainable mobility and enhance the progressive introduction of electric city-cars in a balanced way.
These stations are capable of integrating and making the most of renewable energies, at the same time that help stabilizing the network. The project favors EV owners, boosts all sustainable patterns of mobility and effectively replaces the current charging infrastructure without any viability.
Each station is an automated docking space for an electric car share service of a fleet of 10 electric city cars. By using the same lead-in wire —so no extra space, cost and maintenance is required— SUMOSU Stations also provide fast charge to e-taxis and private users. Within the same facilities, a battery swapping service is also offered only to public bus lines. Absolute safety is guaranteed to the user as access is controlled to areas where dangerous voltages are present and all services are provided by authorized staff.
Along with their roadmap, Sumosu Stations ultimately seek to help and assess city planners, mayors and local governments to develop real smart cities through smart planning.

Status

Patented technology, small scale prototype, building plans developed.

Applications

SUMOSU Stations propose a basic network of stations that provide publicly accessible charging infrastructure for the whole e-mobility system of a city, looking after the needs of users ranging from e-taxis to city electric buses, car-sharing fleets and private users. Moreover, these stations have also been designed to become key infrastructures to enable an efficient interaction with the grid, increase its safety and reliability and favour locally-based energy distribution and autonomy.
Other relevant features are:

- Their open nature, which means that it is an infrastructure compatible with all car and battery manufacturers and, therefore, a system that will very likely and easily be accepted by the industry and the general public.
- Their optimum use of the parking space, since they include a new system that allows for up to 15 vehicles to park in no more than 120 m^2, which is an extremely valuable feature in a city where parking space is very limited.
- Its ability to operate in the electricity market, and make profit out of an intelligent management of the electric charge, as it will able to inject to or absorb power from the local grid if required.

Potential cooperation partners / Customers

Local authorities, car sharing companies, city planners, renewable energy producers, public transport organizations, city mayors, machinery development and construction, EV manufacturers, urbanists.
Depending on the partner, partnership could range from production licence under our supervision to share the registered patent of the product.

EVSE & Smart Meters

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Technological description

ZIV has developed a complete product portfolio for EV charging with state of the art, design-award winning mode 3 charging stations (with models covering charging powers between 3.7 and 43kW) for public and private use. ZIV has also developed an OEM product portfolio consisting of chage control & communication modules, smart meters and SW solutions for EVSE management.
These OEM modules (EV recharge controller —CRV—, smart meter —5CTM and 5CTD— and management software - ZIV EIM) can be used to build master-slave systems, standalone charge spots etc. with different communication capabilities and charging powers ranging from one phase 16A, 230VAC up to three phases 80A, 400VAC. These modules also allow users to build multisocket charge spots using one CRV and as many smart meters as power outlets they want to have in their charge spot.
EV charging products of ZIV offer a combination of 3G, GPRS, Ethernet and low voltage PLC communications which, combined with a powerful SW engine, makes these products a very flexible platform to build and deploy a secure, customizable EV charging infrastructure while keeping things very simple for the end user.

Status

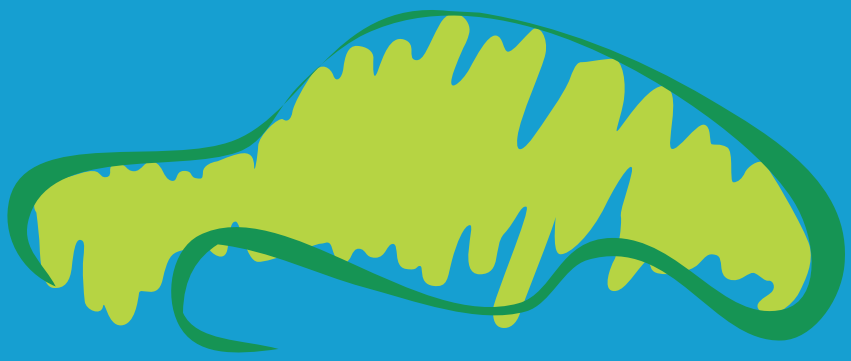
EVSE: Different models for public (ground-mount or wall -mount) and private (wall-mount) charging have already been deployed and are working successfully.
OEM modules: Smart meters and CRV modules are already available. New models with 3G communications are being introduced in June 2012.

Applications

EV charging in mode 1, 2 and 3. Smart charging, current modulation with PWM signal, etc.

Potential cooperation partners / Customers

E-mobility operators, utilities, system integrators, EV manufacturers, EVSE manufacturers that are not focused on HW/SW manufacturing, etc.



Testing infrastructure

Electric Vehicle Laboratory

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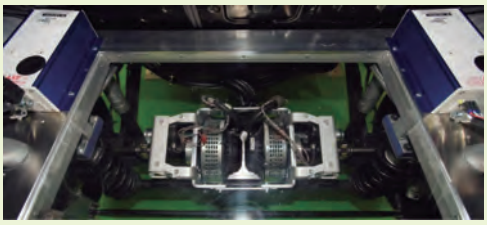
Technological description

Cidaut has designed and manufactured an Electric Vehicle technological demonstrator to be used as a living laboratory. In this regards, it has been used to test different power train configurations, batteries technologies, electronics, dynamic behaviours and so on.
The main characteristics of this demonstrator are:

- Independent motors in the rear wheels.
- Variable dynamic behaviour.
- Optimized energy consumption: Exterior rear mirrors replaced by cameras and lights changed into LEDs.
- Sensor Information in real time of all the important parameters from the batteries: temperature, intensity, voltage, state of charge and state of health.



Status

This living laboratory is ready to become the testing ground of any algorithm, technology and battery solution developed by industrial companies in the EV industrial area. The vehicle modularity and flexibility to incorporate new developments will allow real-time and real situation testing of those solutions in a driving vehicle.

Applications

New battery technologies, battery management systems, electric motors, electric power train, control dynamic algorithms and so on can be implemented in this testing vehicle to assess performance under real driving conditions. The data gathered will be used to evaluate the developed technology.

Potential cooperation partners / Customers

TIER 1 and 2 in the automotive supply chain with developments for future Electric Vehicles, especially electric motors, batteries and power electronics. Also ICT and algorithm developers in need of a real driving and performance test.

Cold starting facilities

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Technological description

Combustion in Diesel engines is especially problematic during the starting and warming-up periods, mostly due to the low temperature of the gas inside the cylinder, which has a negative influence on all the processes leading to fuel self-ignition. This problem becomes specially important when the cylinder displacement is reduced, as usual with current downsizing techniques and vehicle electrification. In response to this challenge, the CMT-Motores Térmicos group at Universidad Politécnica de Valencia started in 1999 R+D its activities in the field of cold starting of direct-injection automotive Diesel engines. In addition to a professional staff trained in this subject, CMT-Motores Térmicos has self-developed fully instrumented climatic chambers for engine cold start tests, with the following characteristics:

- Simulation and control of ambient temperature down to -30°C.
- Simulation and control of altitude up to 3,000 m.
- Simulation and control of relative humidity conditions between 40 and 80%.
- Able to contain full vehicles up to 5 m long.

In addition, to study the warm up phase, even in transient conditions or during homologation cycles, an engine test bench in climatic cell is also available.

Status

The previous facilities are completely available and CMT-Motores Térmicos has computational tools which range from lumped models to CFD software to provide an added value to the experimental information.

Applications

The means available at CMT-Motores Térmicos allow for the study, the comprehension and the analysis of the most relevant phenomena affecting the cold starting and in general the heat transfer problem on engines.

Potential cooperation partners / Customers

CMT-Motores Térmicos facilities are at the disposal of any customer interested in:

- Diagnostics and prediction of heat flows associated with engine operation and their relation to performance and emissions.
- Development of measurement techniques for the heat transfer characterization of relevant elements.
- Analysis, evaluation and development of innovative thermal management strategies.
- Use of thermal management to alleviate the problems associated with cold starting and warming-up in engines.

Evaluation/design of systems aimed to improve engine cold start.

Turbocharging test facilities

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Technological description

Turbocharging has become one of the most important components in modern engines to improve efficiency and extend flow range. CMT Motores Térmicos has been working in the characterization of phenomena like compressor surge, pulsating flow in the turbine, acoustic transmission, heat transfer, durability, etc. Two state-of-the-art facilities are available, devoted to the experimental characterization of compressors and turbines in complex and very controlled situations:

- High flow turbocharger test bench. In this facility a flow up to 0.5 kg/s and 750 °C both steady and pulsating is generated in a 11 liter diesel engine to blow any engine element. Usually it is used to drive turbochargers of passenger car and truck sizes. In this facility the number of cylinders blowing the turbine can be changed according to the flow capacity of the turbine. In the compressor side it is possible to work in a closed circuit with a cooler and variable air density at the compressor inlet.
- Low flow turbocharger test bench. This second turbocharger bench is a regular gas stand where a flow up to 0.3 kg/s is generated in a screw compressor driven by an electrical motor and then heated up to 650 °C with electrical resistances. In this facility is possible to have pulsating flow by means of a rotating disk at the compressor/turbine inlet.

Status

Both facilities are fully operative, the latest since late 2011.

Applications

Turbocharger test rigs are designed to characterize compressor and turbine behaviour at both steady and transient conditions. Experimental techniques for characterization of heat transfer and failure diagnostics can be applied. Testing the altitude effect on turbocharging is also possible.

Potential cooperation partners / Customers

CMT-Motores Térmicos are at the disposal of any customer interested in evaluating the performance of a turbocharger. CMT-Motores Térmicos has a wide experience collaborating with both turbocharger and engine manufacturers in turbocharging research and development.

Electric and hybrid test bench

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Technological description

The Automotive Research Institute has developed a complete electric and hybrid powertrain test bench in order to give an answer to the automotive sector demands regarding these technologies. This bench consist of 2 high torque dynamometers (around 9,000 Nm) developed to simulate the conditions on a heavy duty vehicle wheel. Thus, it is possible to test both powertrains through its axle and its differential (gearbox, etc.) and future electric plants in which we will find in-wheel motors.

Status

The test bench for electric and hybrid configurations is currently being tested by our technicians and almost ready to provide service.

Applications

With this high technology tool, it is possible to test many areas around heavy duty powertrain, such as torque and power tests, electrical flows, electromagnetic tests, battery performance tests, cooling issues, and many others.

Potential cooperation partners / Customers

This product is intended for any entity that needs to test an electric and hybrid heavy duty powertrain, such as vehicles and components manufacturers, owners, public administrations, universities and many others.

Electromagnetic Compatibility Testing

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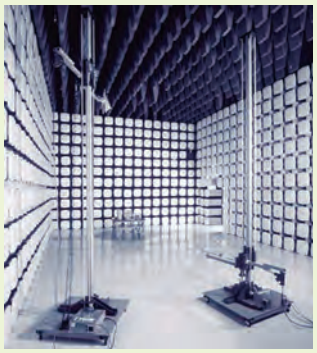
Technological description

Electro-magnetic characterization and integration of complex systems:

- R&D, consultancy and technical assistance in electromagnetic compatibility (EMC).
- Electrical Laboratory accredited by ENAC-ILAC for "Electromagnetic Compatibility tests: emissivity and immunity" (Certificate 100/LE257 rev14 4/13/2012).
- Semi-anechoic chamber for measurements at 3 meters and new larger chamber for measurements at 10 m (operational in 2013); main features:
  - 26 MHz - 18 GHz Frequency Range.
  - Full Compliance Testing for Radiated Emissions (ANSI C63.4-2000 15 & 18, EN 50147-2, CISPR 11, CISPR 16, CISPR 22, Bellcore GR-1089, SAE J551).
  - Full Compliance Testing for Radiated Immunity (IEC 61000-4-3, ENV 50140, SAE J-1113).



Status

Currently, emissivity and immunity tests in semi-anechoic chamber for measurements at 3 meters.
Operational in 2013, new larger chamber for measurements at 10 meters.

Applications

The proportion of electronic components used in vehicles has been increasing in recent years. Automakers are relying more heavily on electronics technology, both in control systems (e.g., power-train components and antilock brakes) and devices (e.g., car audio systems).
Integration, safety and robustness of all these systems and of those considered in hybrid and electric vehicles (e.g., electric motors and converters) are open challenges in the automotive industry. To deal with that ITA capabilities include:

- Analysis, evaluation, diagnosis and problem solving regarding electromagnetic compatibility.
- Pre-compliance tests in the product prototype or design stage.
- Electromagnetic compatibility tests in compliance with standards.
- Research projects.

Potential cooperation partners / Customers

- Companies (OEM's, Tier1 and Tier2) who need collaboration in the development of new products, modification of current ones for compliance with standards or testing in electromagnetic compatibility.
- Partners to participate in national and European public funding projects.

TESSA: Testing Facility for Impact Biomechanics

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Technological description

TESSA is the Laboratory for Automotive Safety Technologies. It belongs to the University of Zaragoza, and its management corresponds to the Aragón Institute of Engineering Research (I3A).
The lab is operative in MOTORLAND technology park area, in Alcañiz (Teruel) and focuses a huge part of its activities in crash testing of components and systems related to vehicle safety, occupant safety and vulnerable road users safety (motorcyclists, pedestrians, etc.).
The research carried out in TESSA mainly focuses on safety improvement:

- Crashworthiness, calculation and optimization of vehicle structures based on numerical and experimental techniques. This kind of research also applies to EVs.
- Advanced driving simulators and unmanned vehicles with application to civil and military purposes (such as explosives deactivation).
- In-depth traffic-accident investigation as a way to understand why and how accidents happen, to optimize the design of vehicles and, in general terms, to define the most appropriate prevention activities.

Nowadays, TESSA is starting impact biomechanics activity. A universal impactor and a crash simulator are being adapted to perform biomechanical research, including human cadaver testing.

Status

Classical crash-test activities are fully operative at TESSA. Biomechanical testing —including human cadaver— is consolidating within the frame of a European Project.

Applications

All kind of applications in the field of Automotive safety specially focused in passenger and pedestrian safety.

Potential cooperation partners / Customers

Our potential customers and partners are all the companies and organisations within the Automotive Industry looking for product improvements and technology developments in passive safety and passenger protection.

Others: simulation, transport system integration business

E-Mobility Broker for Electric Vehicles

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Technological description

The E-Mobility Broker (EMB) is the entity and associated ICT system that allows managing the offering energy demand and supply in an Electric Vehicle, scheduled energy consumption plan, forecasts of load profile and balancing area maps information. The E-Mobility Broker notifies energy demand to Balancing Responsible Party (BRP) and power supply to the OEM Back-End, which represent also the Fleet Manager (FM). The EMB is likewise considered as a Commercial Virtual Power Plant (CVPP), which is an aggregator of CVPPs because it is able to manage several OEM Back-Ends that also represent a set of a FM or CVPP.
The E-Mobility Broker provides information regarding Balancing Area (BA) locations to CVPP (Fleet Manager) and information on energy demand and supply of the Balancing Areas (BA) locations to the OEM Back-End. EMB also receives charging and discharging capacities data from CVPP per BA, getting or receiving event or notification about the basic charging and discharging capacities information. Consequently, the E-Mobility Broker is not only considered an aggregator for charging and discharging needs for BA, but also a collector of data related to charging and discharging requirements for a set of Balancing Area. Additionally, the EMB manages the decomposition of BRP schedules for CVPP through a disaggregation process. In summary, the E-Mobility Broker manages the relationship between BRP schedules, the BRP manages and provides a plan of schedules for the forecast of the energy consumption and supply and the e-DASH OEM Back-End provides the forecasts of load profiles optimized and applied by the Fleet Manager. All of this taking into accounts the corresponding BAs where specific areas could need more or less energy than predicted. Moreover, E-Mobility Broker is responsible for distributing eligible tariff information to relevant actors, based on the information provided by E-Mobility contractors.

Status

EMB is at the first demo status with expected date of production being October 2014.

Applications

Finally, the EMB can be considered to manage services and data in the scope of covering HUB functionalities which allow multiple external entities to communicate between all others through a platform which can coordinate, orchestrate, adapt, process, compute, transform, distribute and dispatch the information to each actors or entities allowing and ensuring an high level of interoperability with other services or entities.

Potential cooperation partners / Customers

OEMs/DSOs/Charging Spot Managers & Companies.

Remote Sensing Device (RSD) – Emission and fuel consumption control and management

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Technological description

The RSD technology is able to remotely measure the emissions and fuel consumption of the circulating vehicles. These devices use IR/UV spectrophotometry to accurately measure: CO, CO_2, NO_x, HC and PM. Also, each record is completed with the kinetic conditions of the vehicle and a picture of its licence plate. All the measurements are taken within half a second and without the vehicle having to stop.
The RSD technology comes with a high-end software solution. The proprietary application consolidates data and calculates the emission values in meaningful units (g/l, g/km, g/kWh). All the information is available via web, where the clients can access the information in real time, download charts and tables, and also create their own customised reports.

Status

The technology is currently fully functional and operating in many RSD programs worldwide. The accuracy of this technology has been extensively tested and the results have been positive, with very high correlation values when compared with other analytical devices such as PEMS (85-95%).
Technet-Bivento has extensive experience both with public (National, Regional and Local) and private clients (logistics, beverages distribution, passenger transport...). Technet has the exclusive rights to commercialise this technology all over Europe. The RSD technology is in the last stages for being fully ISO 17025 accredited.

Applications

For public administrations: Fleet characterization and traffic emissions inventory; High Emitter identification; Clean Vehicle identification; Efficient mobility policies; Better air quality.
For private fleets: Corporate Social Responsibility; Reduced operational costs; Quick and cheap audit program.

Potential cooperation partners / Customers

Partners:
- Any size company interested in distributing the RSD technology in their country or area of operations.

Customers:
- Public administrations willing to implement efficient mobility policies and improve their air quality.
- Private companies willing to improve the efficiency of their fleet, save money on fuel and reduce the impact of their emissions.

CEVNE: Electric/Petrol car calculator //ve.cartif.com

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Technological description

CEVNE is a calculating tool that compares electric cars to petrol or hybrid ones in terms of economic investment. In order for the comparison to be realistic, several parameters must be accurately introduced: annual driven kilometres, electric car range and two correction factors (efficiency and fuel/electric consumption). It is advisable to check/estimate the foreseen fuel price and electric tariff for the time period under study.
A database provides the user with a fair amount of car models from several countries. For all these cars the following information has been allocated: purchase price, consumption, range (for the electric ones), battery capacity, monthly fee paied for the battery (in case of battery hire), average annual expenses (including taxes and insurance) and average maintenance costs per kilometre.
The user gets from CEVNE information on annual savings, costs per kilometre and annual driven kilometres for which, either the electric or the petrol/hybrid car, is advised for purchase. This information will eventually help those considering the possibility of buying an electric car or investing money on it, to take the right decision on which electric car, if any, is the most suitable for them.
A systems dynamics model supports the results obtained with CEVNE by means of an estimation of future electro mobility demand foreseen in the short term.

Status

Free web site accessible from http://ve.cartif.com.

Applications

Guidance for selecting the most adequate car in terms of money investment according to the user needs and driving habits.
Main applications are:

- Private fleets, mainly in urban environments.
- Car-renting.
- Decisions taken on electro mobility policies encouraged by public administrations.
- To raise public awareness of electric mobility advantages.

Potential cooperation partners / Customers

- Private fleet owners.
- Car-renting owners.
- Public administrations.
- General public.

Sustainable Urban Mobility Plans. Energetic and Economic considerations

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Technological description

Methodology for the evaluation of the sustainability in the urban mobility. Study of the public transport offer and evaluation of improve scenarios.

Status

Methodology about eco mobility developed to evaluate the energy and economy sustainability of the public transport. The methodology has been validated with the case study of the city of Zaragoza.

Applications

Elaboration of urban mobility actuations.
Promotion of new forms of car's use like carpooling or carsharing.
Support the stakeholders involve in the take decision phase about the mobility policies in urban areas.

Potential cooperation partners / Customers

High potential for public administration and manufacturers of vehicles directed to public transport like trams or bus.

Criteria of Electric Vehicle Fleet Selection

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Technological description

This is also a part of the larger project of UDSmart GridTM and is related with the best possible selection of the electric vehicles that have to be used in case of the 'Short-Term Leasing' case/service and according to the needs of a University Campus. The criteria that have been considered were:

- Car Price.
- Battery Characteristics.
- Distance to be applied.
- Car Autonomy.
- Car speed.
- Practicality of the car.
- Years of the car before substituted.
- Company Localization.

Status

It is expected to be employed all the different selected electric vehicles in case of a further implementation of the UDSmart GridTM concept.

Applications

The model followed and the required steps would be interesting to be used for any 'Renting Company' as well as any Municipality that would like to exercise the use of these vehicles.

Potential cooperation partners / Customers

The customers of such a service are the ones mentioned also above to the applications points.

EcoElCarTM

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Technological description

This work is related with the creation of an ecological (but also technological and more economic) service provided mainly in the Urban area of Bilbao (or any other Urban area of any city) based on the University Campus of Deusto, to serve the mobility for students, academics and administration staff from their residential point to the University Campus. Even more this is a Short-Term Leasing E-transportation service (i.e., electric car-scooter-bicycle) under the specific case of a UDSmart Grid™ concept. Created algorithms/protocols allows a Smart Vehicle Reservation from the customer with the simple use of either a Smart Phone/PC through Internet on a static or dynamic way (i.e., while at home, cafe, etc or walking), showing the closest available parking spot of picking-up the selected/reserved e-vehicle as well as the required time, distance, traffic and alternative routes once in the way or in the car towards the final destination (UD Campus or UPV/EHU Campuses). This service also includes a holistic approach such as the charging/discharging of the e-vehicle while parked (with a parking slot e-vehicle optimization) in the UD Campus as well as the Design of a New Charging Station (charging posts) and the corresponding services that serve the fleet of the EcoElCar™ service when parked while new algorithms are designed for the optimization of the interaction between microgeneration sources (PVs, wind under forecasting analysis) proposed to be installed on the roof of the parking lots, thus a PV2EV situation. Even more in case of the necessity of more energy for the EVs, then the algorithms are adapted to a Grid-to-Vehicle (G2V) situation. Integration of the mRES and EVs into the Smart Grid can be considered a step towards the adoption of a de-centralised system.

Status

The project is in a phase where various parts have been completed and is expected to have a great part finalised till end of September 2012 once also further funding existed.

Applications

Applications in the various Universities Campus of either the proper city of Bilbao or cities that do have University Campus and want to proceed on a 'Green Campus' situation while profiting their members from such an implementation. This service although has a primary customer the University Campus Directives of different cities it can easily be adopted to any other transportation policy that would like to be implemented by the Municipalities/Autonomous regions.

Potential cooperation partners / Customers

Primary customers: Universities and their Campus, Municipalities of the cities ('Green Cities').
Cooperation with potential automotive companies, especially the ones in the E-transportation market: a pilot-plant implementation to verify this Business Model.
Other partners: ICT companies, either implicated in the production of the protocols/algorithms created, companies of the electricity sector (good example of the Smart Grid concept in presence of microRES and EVs integration).
Customers: automotive renting companies.

'Universal Campus@' Smart Electric Vehicle Charging Station Design

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Technological description

A new product of electric vehicle charging posts and according to the International Standards IEC 62196-3 has been designed for the needs of the possible implementation and application of the University of Deusto (UDSmart Grid™) concept/project according to the existing parking dimensions of the Campus and the required number of EVs as part of the Larger Project of EcoElCar™. This Charging Station is exterior and according the IP54 and has 1 plug with an internal battery while covered by an anti-oxidant colour material from resistant stainless steel.

Status

The design has been completed as well as the economic analysis; it is further expected to be produced in short time a prototype that would serve to finally proceed to a possible commercialization of it.

Applications

The applications of this innovative charging station design would be able to be implicated in stations related with the electric vehicle transportation as well as in existing gas stations.

Potential cooperation partners / Customers

Any company who would like to manufacture it and commercialise it on projects related with the electric vehicle applications (and not only). Also Municipalities who would like to implement the use of e-transportation in their territory and automotive companies who produce electric vehicles and would like to offer a whole EV package.

GITEL_REV_TOOL

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Technological description

The objective of the tool is to develop a tool to obtain the planning of the recharging infrastructure for electric vehicles in an urban environment, taking into account aspects not considered previously, such as the size of the recharging station, the technology or the available plots within the city; in this case, the range achieved by vehicles is not a factor as decisive as in previous studies because of the distances between stations are shorter than in inter-city trips. The tool focuses on finding solutions for those particular cases in that is necessary to give efficient recharge service (availability, fast recharge) to private fleets and vehicles. The case of slow recharge on housing for private vehicles, despite being the type of recharge is expected to extend more quickly, is not going to be considered because in the early stages of implementation is considered enough the incorporation of accountants in the existing electrical network of the garages.

Status

At the present, this tool is a prototype. Is necessary to include to the software some design criteria.

Applications

The tool that has been developed obtains the planning of the recharging infrastructure for electric vehicles in an urban environment. It is possible to reach results in tree criteria:

- Solution total cost. It considers the cost of equipment, energy, grounds, maintenance, operation, preparation, implementation and building.
- Total area required by the total number of recharging stations to meet demand.
- Efficiency.

It is possible to determine: the number of facilities to meet demand, the cost, the required area, the power source and models for the necessary equipment.

Potential cooperation partners / Customers

Society today is demanding efficient transport systems, both in terms of energy as well as environmental. For that end is required a better use of energy and the reduction of pollutant emissions into the atmosphere.
With this aim, European cities are interested in develop an electrical infrastructure for electrical vehicles and this tool would be really useful because it allows to obtain an optimal solution.

FEV Cloud Simulator for Smart Cities

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Technological description

E.T.E is a Fully Electric Vehicle capable traffic simulator developed by HI-Iberia under the frame of the project FP7 Ecogem and continued under the project ARTEMIS ACCUS.
Based on open source it delivers:

- High performance and quick results delivery.
- Cloud access. No need for installation.
- Includes several types of electrical vehicles and associated batteries.
- Able to run in only FEV mode, mixed mode, or traditional vehicles mode.
- Highly customizable in terms of simulation parameters, environment variables, etc.
- Able to provide output in graphical format of XML files to be further incorporated to third party software.
- Incorporates recharging point infrastructure: management, placement, consumption per station, different types of recharge, etc.

Status

The technology is currently in prototype status, while new features are being added and the software is being improved and debugged.

Applications

E.T.E can be used for assessing the impact in terms of introduction of FEV by:

- A City Council: benefits in terms of CO_2 reduction, decrease of traffic engines noise, needs in terms of public space for the placement of recharging points, traffic prediction of the impact of FEV in a city (number of stadistically stuck cars...).
- Public regional or national governments: In order to assess and evaluate the results of the introduction of new policies and regulatory measures before they are firm.
- Utility companies in charge of placing the recharging points: in order to assess better situation, demand estimates, consumption estimates, etc.
- For FEV manufacturers : for marketing purposes, for estimating the usage of their vehicles, in order to assess the real behaviour of their vehicles without the need of extensive and costly trials...

Potential cooperation partners / Customers

HI-Iberia is interested in collaborating with any kind of the above potential users or key customers for a win to win synergy. The end user will benefit of the use of the platform while HI-Iberia will on the other side improve the product and better align with the potential larger's clients expectations.

Electric Vehicle deployment support systems

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Technological description

Platform for managing and controlling electrical vehicles charge terminals and e-mobility systems.
Smart recharging devices.

Status

In production and commercialization.

Applications

Charging manager and mobility companies.
Single and three phase chargers for private and public applications.

ONFLEET – Electric Fleet Management System

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Technological description

ITENE has experience in the development of fleet management software and applications for the transport sector. This is the case of the ONFLEET application which allows the monitoring of a number of vehicle parameters (GPS position, speed, engine rpm and fuel consumption and for ICE vehicles, etc.) obtained through the CANBUS interface of the vehicles. CAN bus is a vehicle bus standard designed to allow microcontrollers and devices to communicate with each other within a vehicle without a host computer. The innovation of the new tool developed by ITENE lies in the application of the ONFLEET to electric vehicles. ONFLEET —Electric Fleet Management System— monitors vehicle real-time data including parameters such as GPS position; instantaneous speed; electricity consumption; battery level; weight; route gradient; driving hours; stops and starts; temperature.
The data for the analysis are collected remotely without interrupting the daily operations of the company or of the drivers thanks to the CANBUS technology and to the software developed by ITENE. A device is installed in the vehicles in order to periodically obtain the information through the CANBUS interface and in order to integrate this information with the geographical information obtained by means of a GPS existing in the device. The installation is non-invasive, without altering the vehicle manufacturer's warranty. All the information gathered is sent to a control centre by means of a GPRS connection which is also available. All the data is processed and validated in the control centre, and integrated in a database. A computer application dynamically generates reports about the vehicles' performance considering the most representative parameters involved in the use of EVs.

Status

ONFLEET - Electric Fleet Management System is a prototype being tested in the framework of the FREVUE project "Validating FReight Electric Vehicles in Urban Europe" http://frevue.eu/. The tests are planned to be carried out between 2013 and 2014.

Applications

The main functionalities of the tool are presented in the following table:

- Web and desktop application: Easy-to-use tool with access from companies' computer.
- Real-time vehicle positioning: Route optimization with a continuous monitoring of the vehicle autonomy (battery level).
- Graphical representation of vehicle performance: effect of temperature, route gradient, load, stop-start on battery range.
- Eco-driving: effect of driving style in battery performance; learning tool for drivers.
- Warning system: excessive speed; excessive length of vehicle stop; excessive electricity consumption; level of battery below a certain level.

Potential cooperation partners / Customers

Among the potential customers of the ONFLEET solution can be mentioned the Logistics Service Providers, private and public transport companies (freight and passengers) or car-sharing companies.

E:sharing® – Interoperable Electric Carsharing System in the Metropolitan Area of Valencia

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Technological description

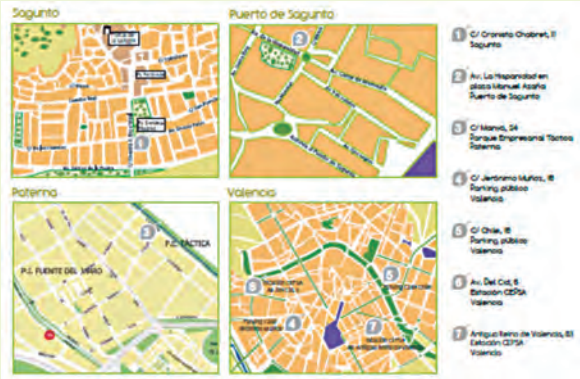
The innovative electric carsharing system E:sharing® developed and validated by the company MOVUS during the period 2008-2011 it is currently operative in the metropolitan area of Valencia city. The development of the system has included the following tasks:

- Implementation and Validation of the service. The system integrates a set of novel technological developments in the field of clean vehicles, ICT and mobility management system. The validation activity has included: collection and report of system inconsistencies, operational data and usability degree.
- Assessment of customer satisfaction and mobility patterns evolution: on-line customer satisfaction surveys, interviews, assessment of service-related impacts.
- Optimization of the business model. The results of the previous task have supported the definition of measures to adjust the business model with the goal of a successful further implementation.

The E:sharing® system includes three key elements: (a) The charging infrastructure which includes fixed recharging stations located in optimal positions around the city, (b) Smart electric vehicles communicating with the electric charging infrastructure and a Central Management System which implements all operational functionalities required (optimization of the recharging process, user identification and billing process).

Status

Currently the system is operative in the metropolitan area of Valencia with a fleet of 10 electric vehicles and five stations located in public parkings and public spaces of Sagunto and Valencia cities. At the end of 2012, it is planned to install news stations at the Polytechnic University of Valencia and the objective is to reach a fleet of 40 vehicles by 2015.



Applications

Sustainable mobility service for business and private users.

Potential cooperation partners / Customers

The CARSVAL projects targets professional and private profiles (in particular the tourist one).
Potential cooperation partners for deployment of the service in the city are: the municipality hotels, management companies of public parkings, shopping centres, tour operators, etc.

DYNACAR® RT – Tecnalia

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Technological description

Road vehicle model for ECU's and Powertrain rapid prototyping
DYNACAR® is a road vehicle modeling tool, developed in LabVIEW RT. It is fully oriented for ECU's and powertrain systems designing process, allowing a rapid prototyping, implementation and real-time testing of new vehicles and solutions at early stages.
The system combines longitudinal and lateral dynamics for maximum flexibility. HW and Human in the Loop concepts are also embedded in the system. The first concept demonstrators was carried out in 2008.
When combined with NI VeristandTM / InertiaTM, custom control algorithms and simulation models generated with other languages can be easily integrated into the vehicle model. DYNACAR® RT easies powertrain engineers through their own vehicle model generation, using an own graphic user interface with an advanced virtual environment. Supervision and real time are fulfilled using all VeristandTM/InertiaTM capabilities.
NI VeristandTM by National Instruments.
InertiaTM by Wineman Technologies Inc.
Characteristics of SW Platform:

- Fully-developed in Labview RT, therefore deterministic performance.
- Loop solving time less than 1 ms. in RT (using PXI 8110).
- 3 main loops distributed in PXI 8110 cores for maximum efficiency.
- Integrated in RT test platform software for testing equipment (InertiaTM by Wineman Technologies Inc.).
- Compatible with NI VeriStandTM for HIL of ECUs, combining HIL input with defined tests (standard drive cycles, physical tests...).
- In sum, robust, deterministic and fast solutions for HW integration.

Status

Commercial.

Applications

Concept development, automotive and vehicle design, powertrain and dynamic systems dimensioning.

Potential cooperation partners / Customers

There are two partners: Wineman technologies for Nafta market and Aries Technology for Europe and Asia.
It is oriented to all companies, OEM, T1 and T2, and centers involved in developing new solutions and concepts for cars, as well as dimensioning systems and components in a SW-in-the-Loop, HW-in-the-loop environment and limited cost.