



Report on the Joint EC/European Green Cars Initiative Expert Workshop 2011 Europe's Strengths, Competencies and Job Opportunities in Electric Vehicle Battery Manufacturing

1 February 2012

1.) Objective

On 7 December 2011, an expert workshop on “Europe’s Strengths, Competencies and Job Opportunities in Electric Vehicle Battery Manufacturing” was held in Brussels. It had been organized on behalf of the European Commission and two European Technology Platforms involved in the Public Private Partnership European Green Cars Initiative (ERTRAC and EPoSS) by the Coordination Actions “PPP Implementation for Road Transport Electrification” (CAPIRE) and “Information and Communication Technologies for the Full Electric Vehicle” (ICT4FEV), and was supported by the Spanish Centre for Industrial Technological Development (CDTI). This workshop was the third event of a series of joint European expert workshop dealing with batteries and energy storage systems for the electric vehicle (EV)^{1,2}.

The focus of the workshop was on current European activities related to research, development and innovation in the domain of manufacturing of electric vehicle batteries. The approaches and first results of collaborative research projects funded under the Public-Private Partnership European Green Cars Initiative were presented either orally or on posters. Furthermore, relevant pilot actions for battery cell and system manufacturing from select regions in Europe were reviewed. Finally, opportunities for Europe to create added value by promoting joint research, linking pilots, and establishing new innovation flagships were considered. Thus, the workshop aimed to provide concrete recommendations for future R&D&I and supporting activities, in line with the recommendations of the high-level group on Key Enabling Technologies (KET)³ and in preparation of Horizon 2020, the future common framework for research and innovation⁴.

The participants included the coordinators of European collaborative research projects on batteries, leaders of major pilot activities for battery manufacturing, representatives of European companies from the field of energy storage cell and battery technology as well as research institutions and delegates of national and regional governments and all involved Directorates General of the European Commission.

2.) Workshop Structure

The Workshop was jointly opened by Wolfgang Steiger from Volkswagen, the chairman of ERTRAC and the EGCI Advisory Group and Herbert von Bose, Director Industrial Technologies of the European Commission. The regional and global dimensions of the workshop topic were considered by Xabier Garmendia, Vice-Minister of Industry and Energy,

¹ Report on Joint EC/EPoSS/ERTRAC Expert Workshop 2009 “Batteries and Storage Systems for the Fully Electric Vehicle” held in Brussels on 19 June 2009.

² Report on Joint EC/EPoSS/ERTRAC Expert Workshop 2010 “Electric Vehicle Batteries Made in Europe”, held in Brussels on 30 November 2010.

³ Final Report of the High Level Expert Group on Key Enabling Technologies, June 2011.

⁴ Horizon 2020 - The Framework Programme for Research and Innovation, COM (2011) 808.

Basque Government (Spain), and by Setsuko Wakabayashi from NEDO in their keynote speeches giving an overview on EV strategies, status and future opportunities in the Basque country and Japan, respectively.

Dedicated sessions were held on the following themes:

Session 1: **Strengths and Competences**

Session 2: **Manufacturing and Regional Dimension**

Session 3: **Coordination and Standardization**

Furthermore, EU funded EV battery projects with a focus on fundamental research were presented on posters⁵, and a brochure with abstracts of all current projects of the PPP European Green Cars Initiative was distributed⁶.

The workshop was closed by Dirk Beernaert, Head of Unit Microsystems of the European Commission summarizing conclusions of the workshop and providing feedback from the European Commission to the industry on the topics raised in the workshop. He also reported the current status of the future framework programme Horizon 2020.

All in all 20 dedicated speakers and chairpersons from various European countries discussed challenges and options for the establishment of battery manufacturing in Europe. More than 90 experts representing battery and cell manufacturers, recycling companies, vehicle manufacturers, suppliers, research organizations and public authorities attended the workshop.

3.) Report from the Workshop Sessions

Opening Session

As an introduction to the thematic domain of the workshop dedicated speeches and presentations were given by representatives of the European Commission, the EGCI Advisory board and public authorities from the Basque country and Japan.

In his opening remarks, **Wolfgang Steiger** from Volkswagen, the chairman of ERTRAC and the EGCI Advisory Group, pointed out the need of moving forward along the innovation path related to EV batteries in Europe: Research in new production technologies would be needed, related pilot production should be started and finally, innovation flagships should be implemented in order to master the related issues in terms of safety, durability and competitiveness and to exploit the market potential of electric mobility. Such move of collaborative research and development activities into more competitive areas would imply a need for appropriate project structures, e.g. limiting the number of partners and lightening the IP issues. Furthermore, cooperation between the initiatives in various European member states should be aimed at.

Herbert von Bose, Director Industrial Technologies of the European Commission's DG Research, emphasized the importance of European coordination in the field of EV battery manufacturing: duplication of research and development efforts or double spending at European Union and Members States should be avoided in order not to waste resources. A few exceptions might be justified such as e.g. for the validation or proof of data. He also pointed out that in Horizon 2020 research will not stand alone any more but be linked to innovation. One tool of combining research and innovation could be the Public-Private Partnerships (PPP) bringing together industry to give advice on what direction should be taken in Europe, and building on research institutes and academia in the phase of implementation in collaborative projects. The content of the PPPs in Horizon 2020 would still have to be decided, but any PPP would be based on a commitment from industry to go into

⁵ AMELIE, APPLES, AUTOSUPERCAP, ELECTROGRAPH, EUROLIION, HELIOS, LABOHR and SOMABAT

⁶ Project Portfolio European Green Cars Initiative PPP, 2011.

the next stage of innovation. Mr. von Bose finally also mentioned that through the last call of FP7, to be published in mid-2012, the European Commission will be able to make available a significant amount of budget for funding of projects on the EV and its energy storage systems.

Xabier Garmendia, Vice-Minister of Industry and Energy of the Basque Government in his keynote speech gave an overview of the Basque policy framework on electric vehicle deployment and renewable energies. Complementary to the European and Spanish national EV strategies the Basque government set the stage to reach the target of 10 % of all vehicles being electric in the Basque country by 2020. Mr. Garmendia introduced the key projects running in the Basque country which are embedded into an energy market driven R&D strategy based on three pillars: energy storage, electric mobility and smart grids. Examples include the agreement with Mercedes Benz to build the electric van “Vito” in Vitoria and the launch of IBIL, a company to design, construct, operate and maintain the infrastructure of charging points. Moreover, in May 2011 the CIC Energigune in Vitoria-Gasteiz was launched as a center for research on electric and thermal energy storage. In this context he announced the conference “Power our future”, an International Forum on progress and trends in battery and capacitor technologies focusing on the latest research and development in electrochemical power storage technologies critical for sustainable energy. This conference will take place on 20-21 March 2012 at CIC Energigune. In his conclusions, Mr. Garmendia emphasized the Basque country’s specialization in sectors and activities of the energy value chain and the focus of the Basque country on electric vehicles as a market driver of industrial development. New European flagship projects would be needed in this area, and the Basque country would be willing to contribute to them.

Setsuko Wakabayashi, Deputy Director of the European Office of New Energy and Industrial Technology Development Organization (NEDO, Japan) reported about the Japanese Battery Roadmap and the related R&D program. The Battery Roadmap is being updated biannually by industry, academia and government formulating R&D targets based on market perspectives. NEDO then bases its R&D program on this roadmap. The Battery Roadmap categorizes 3 types of batteries being demanded: Energy density oriented, power density oriented and battery-life oriented where the EV batteries are seen in the energy density category whereas HEV and PHEV batteries are seen as a crossover between energy and power density oriented batteries. Topics for R&D of NEDO’s program are common issues like life-time and aging estimation, safety assessment and test for standards. Research towards scaling up of battery production aims for total cost reduction, enhancement of life cycle, calendar life and safety measures. New materials and processes, cell optimization and production technologies are researched to overcome the performance limitations of Li-batteries. And new concepts of battery and mechanism and new functional materials are investigated for post-Li-batteries. In 2011, NEDO spent around 77 M€ on the funding of related research projects.

Session 1: Strengths and Competences

The purpose of this session, chaired by **Jérôme Perrin** from Renault (France), was to review current European R&D projects which are focussed on aspects relevant to EV battery systems and their manufacturing.

This session was opened with a presentation on basic research, the LABOHR project, by **Elie Paillard** from the University of Münster (Germany). LABOHR targets the development of automotive batteries with ultra-high energy and power densities. The aim is set to 500 Wh/kg and 200 W/kg (at pack level) with an efficiency of more than 99% and 1,000 cycles with 40% maximum loss of capacity. LABOHR is studying the development of new cell chemistries employing lithium or novel alloy anodes, innovative O₂ cathodes operating in the liquid phase, and a novel system for harvesting oxygen from air, which can be regenerated during their operative life without need of disassembling. The implementation period of the project is

over now and the modelling and testing of cells including new catalysts has started considering different cell concepts.

As the first of a series of manufacturing related projects starting in 2011, GREENLION was introduced by **Oscar Miguel Crespo** from CIDETEC (Spain). GREENLION is dealing with possibilities for a more environmentally friendly production of the battery components, a substantial shortening of the battery assembly procedure and for easier and more effective disassembly and end-of-life recycling. These goals are planned to cover 3 key levels of the battery value chain: on the electrode level by employing aqueous electrode processing, on the cell level by improved pouch cell assembly through laser cutting and stack winding, and on the module level by a lighter module design through air cooled solutions, eco-designed bonding techniques to improve sealing and disassembly and 3D design of automatic battery module/pack assembly lines. Eventually, processes will be implemented in a real pilot line.

Jérôme Perrin from Renault (France) presented objectives and focus of the newly started project ELIBAMA. ELIBAMA's objectives are the development of eco-friendly and cost effective processes for electrode coating, electrolyte manufacturing, fast and homogenous electrolyte filling processes, cell joining, stacking and assembly. Furthermore, ELIBAMA aims to improve process control and downstream quality, and to develop non-destructive testing reducing the rate of defective products at the end of the manufacturing chain. Also a methodology for recycling and refurbishing of end-of-life Li-ion batteries will be worked on and a life cycle analysis will be conducted and then advanced eco-design methods for battery cell manufacturing and recycling will be proposed. Thus, ELIBAMA shall significantly reduce the cost per unit and at the same time reduce the environmental impact.

A presentation on the Smart-LIC project was given by **Sven Rzepka** from Fraunhofer ENAS (Germany). As the power density of EV batteries increases, so does (due to the use of more aggressive materials) the danger of thermal runaways or fires and hence, safety of high power density batteries becomes an issue. Smart-LIC addresses the development of a safe and compact battery management system (BMS) concept based on the use of multiple sensors and actuators. It shall be capable of monitoring and isolating a single malfunctioning cell (or a cluster) of cells, and it shall provide high efficiency due to local control, increased precision in determining cell parameters by applying electrochemical impedance spectroscopy, and lower system complexity by employing wireless communication. Further features include increased overall reliability, increased safety especially from thermal risks, cost reduction due to less cabling and simplified electronics, reduced repair costs achieved by continuous monitoring and reduced cost of ownership by significantly increased battery lifetime. The ambitious objectives shall be achieved by realizing the BMS module as a system-in-package (SiP) directly integrated into the lithium-ion cell.

Bernhard Kortschak from AVL (Austria) gave a presentation on the SuperLIB project which aims to improve the overall performance of the battery pack, i.e. a better compromise between power and energy density and to significantly increase the lifetime by reducing the impact of high currents. This shall be achieved by developing a highly integrated dual-cell battery with Li-Ion high-power and high-energy cells in a joint package sharing cooling and balancing circuits. Moreover, sensors and novel DC/DC converters shall be applied and a smart energy distribution by advanced battery management and an extension of the useable state of charge range of the battery shall be implemented. The pack shall be re-useable in passenger EVs and light duty HEVs.

The ESTRELIA project was introduced by **Ewald Wachmann** from Austriamicrosystems (Austria). In ESTRELIA integrated circuits (ICs) are developed as building block for an integrated flexible battery management system enabling simultaneous cell comparison and active cell balancing for ultracapacitors and Li-Ion cells. The IC design is on-going and first improved test chips for active balancing tests have already been verified within the project

E3CAR. Furthermore, new cost effective power antifuse for a dynamical configuration of energy storage units using a concept of self-triggered power antifuses to bypass faulty battery cells have been developed and device simulation has started. ESTRELIA provided the first modified samples of a new gas sensor with high sensitivity and fast response. A piezo resistive concept has been defined for new MEMS based spark detection sensor for improved safety monitoring of energy storage systems. It is currently being optimized in design. Another objective of ESTRELIA is the development of a new ultra capacitor power cell targeting for 50% higher energy density and its verification as power pack extension for energy storage systems.

The debate at the end of this session mainly focussed on the high cost of raw materials and sophisticated control circuits in comparison to the marginal increase of range that they provide. The experts called for including into the running projects LCA analysis focussed on weight of the raw materials used and energy necessary for cell lamination. It was also argued that the described innovations do not only increase energy density but also the lifetime of a battery, and thus their additional cost may be compensated by a reduced total cost of ownership. The experts also called for considering the influence that BMS may have on the recyclability of batteries.

Session 2: Manufacturing and Regional Dimension

A second session was held in order to introduce and discuss the status of current battery manufacturing in Europe focusing on regional initiatives. The session was chaired by **Andreas Dorda** from A3PS (Austria).

Claudio Lanciotti from KEMET (Italy) presented the battery cell manufacturing technologies KEMET has developed for the assembly process flow from electrode notching to the final sealing of the pack. Emphasized that manufacturing speed would be key for bringing down battery cell costs, Mr. Lanciotti pointed out the advantages of the wound stack process for the monocell assembly: higher precision and at least two times faster throughput assembly capabilities compared to a standard stack or z-folding assembly. The process creates a strong bond between the active materials in the cell maximizing cycling efficiency and reducing fade. Furthermore, the position of the electrodes gets fixed over their lifetime eliminating potential shorts. The melting temperature of the PVDF coating is greater than that of a polyethylene membrane. Hence, there structural integrity of the separator during a thermal shutdown is increased as well.

Francisco Carranza-Sierra from Nissan (U.K.) talked about the Renault-Nissan activities regarding battery manufacturing. Within the Renault-Nissan Alliance the goal of accumulated sales of 1.5 million EVs and an annual production capacity of 500.000 EVs, and evidently also EV batteries, per year by 2016 is set. Currently, the company AESC owned by Nissan, NEC and NEC-Tokin and based in Zama, Japan produces cells, modules and packs for EV and HEV with a capacity of 90.000 packs per year. Mr. Carranza-Sierra emphasized that Renault-Nissan is currently manufacturing lithium-ion cells, batteries and packs in its new plant in Sunderland (U.K.) with a capacity of 60.000 packs per year to supply the European electric vehicle assembly lines. A total of 200 new direct jobs and 600 additional jobs in the supply chain have been created, about 50% of these being high-level profile. The production capacity will further increase with Renault's facilities in Flins close to Paris. Mr. Carranza-Sierra pointed out that public support is essential for the R&D and manufacturing of electric vehicle batteries in Europe. Also, customer incentives and charging infrastructure deployment would be critical to stimulate the demand and therefore also create an early market for EV batteries in Europe.

The activities on advanced battery for electric vehicles of CEGASA (Spain) were reported by **Igor Cantero**. CEGASA has a long experience in (alkaline) battery manufacturing and is

taking on the challenges of energy storage for portable, stationary and transport applications. For Li-Ion batteries for transport, CEGASA is targeting cell chemistry, recycling and secondary use keeping in mind the environmental impact. CEGASA opts for a green cell with aqueous processing for electrodes and a modular battery pack that allows quick and easy integration into a wide variety of applications. In cooperation with CIDETEC, CEGASA is able to cover the value chain from R&D to innovation and production to testing and commercialization. Thus, CEGASA will be involved e.g. in electrode and cell development for Li-ion batteries for which it will have a production line up and running in Vitoria (Spain) by end-2013.

Jan Tytgat from Umicore (Belgium) presented Umicore's ideas and strategies for recycling of NiMH and Li-Ion batteries. Umicore sees the economic aspects of battery recycling in the proven market for portable rechargeable batteries. The market for (H)EV has still to be demonstrated, but is generally expected to grow to 10 % of new sales by 2020, as the production targets of Renault-Nissan just confirmed. European legislation for waste management can be expected to lead to an even further increase of the recycling activities. Within this business Umicore takes a unique position because of its technology and business relations. It is the only industrial Li-ion battery recycler worldwide, and the only industrial NiMH-battery recycler that recovers Rare Earth elements (in collaboration with Rhodia). Umicore has established a closed loop for most critical elements and has the possibility to extend its activities other strategic elements in the future. According to Mr. Tytgat, on the societal level, battery recycling may generate quality labour on several educational levels on the local scale and hence, offers the possibility to roll out battery recycling worldwide. In particular, dismantling of batteries should be done locally as it reduces the weight of the waste by 30-40 percent, only smelting requires specialists. Design for recycling would therefore be a key attribute. Mr. Tytgat has once more confirmed that the proven reserves of Lithium are far above the future needs of the transportation industry.

The expert discussion following the presentations of the second session focused on a multitude of aspects related to the European added value and economies of scale that may be expected from the mass production of EV cells and batteries. It was mentioned, e.g., that local manufacturing of batteries would be crucial for establishing production capacity for electric vehicles in Europe. Recycling has a local dimension as well: The transport of a complete battery pack to a remote facility would be the safest option, but shipping of by-products of locally dismantled batteries would be far more efficient. Therefore, it can be expected that there will be only very few recycling hubs worldwide in the future, and the related safety issues have e.g. safe ways of discharging need to be subject to research. A central question related to the cost reduction that can be expected from ramping up production volumes of Li-ion batteries for EVs. Various experts agreed that a baseline cost level of 200 Euros/kWh may be achievable on the long term if very large manufacturing plants are established since in this case the cost will mainly be determined by the cost of materials (80 percent). For the time being, however, the cost effectiveness of Li ion batteries and thus of electric vehicles depends on the investment cost for a manufacturing plant, and on any additional value that may be assigned to them, e.g. though opportunities for second use or recycling.

Session 3: Coordination and Standardization

The third session of this workshop, chaired by **Pietro Perlo** from IFEVS (Italy), was dedicated to discussing standardization issues and the role of SMEs.

First, **Ziva Patir** from Better Place (Israel) in her role as the leader of battery related project team of the Joint CEN/CENELEC Focus group on Electro-mobility discussed standardization issues. She emphasized that standards are and will be essential to help electric vehicles achieve their full potential. The European Commission mandated CEN/CENELEC to overview European requirements for EV standards, to match these against existing

international standards and all relevant work in progress in standards bodies and to derive recommendations on the coverage of standardization gaps indicating also the responsible body and timescale. The focus group published its report in June 2011. An update followed online in October⁷. According to Ms. Patir, Europe has agreed on the vehicle-side connector, recently, but no agreement has been reached on the infrastructure-side so far. The report provides further 69 recommendations covering various fields as e.g. charging parameters (AC, DC, domestic, public, etc.), connectors, plugs and sockets, communication, EMC etc.. 11 recommendations concern batteries state of health allowing re-use, dimensions and interfaces, information and traceability, safety labelling and interfaces with vehicle and switching stations. Other existing efforts regarding battery standardization are taking place on the international level: ISO/IEC established Technical Committees on the electric vehicle and is working on standards for general EV battery safety, and on standards at cell (ISO) and pack (IEC) levels for Li-batteries; a joint committee is planned. Furthermore, there are several efforts existing in China regarding Lithium-ion and Zinc-air batteries for electric road vehicles, Li-ion storage batteries for electric automobiles and dimensions of traction batteries for electric vehicles. Also, in the U.S. standardization is actively approached by ANSI which is preparing a roadmap for the standardization, regulation and compliance for EV mass deployment covering: battery safety, testing, labelling, storage, transport and handling, recycling, secondary uses and emergency shutoff location and procedures. Further cooperation on harmonising regulations related to electric vehicles in the global context, which could lead to cost savings through economies of scale for automotive manufacturers was agreed at a meeting between representatives of the U.S., Japan and the EU at a meeting in Geneva on 17 November 2011.

Maria Luisa Soria from SERNAUTO (Spain) discussed the “Crucial Role of the Full Value Chain and SMEs in Battery Manufacturing”. She pointed out that suppliers are responsible for 70-75% of the value of the vehicle and cover about 50% of the R&D costs. Approximately 70-80% of suppliers are SMEs, mainly Tier2 and Tier3. Development and manufacturing of EV Batteries, a key element in EV deployment, is a field in where Europe lags behind Asian countries that took the lead in product development and commercialization of batteries for consumer applications. According to Ms. Soria, to succeed, the whole European value chain, OEMs and Tier1 as well as Tier2 and Tier3, need to supply new products and technologies (batteries as well as powertrain components, electronics, auxiliaries and materials) in the terms and volumes demanded, in line with to the market evolution. Particularly, in case of initially small volumes, market niches and customised products, SMEs can provide clear advantages in terms of agile response, proactivity, motivation and economic efficiency. Furthermore, they may be a significant source of innovations for components, vehicle concept and business models. However, barriers for SMEs are a lack of financial resources which can be overcome with funding of innovation programmes and access to facilities as well as collaborative work with other actors of the value chain. Also regulation and standardization of products is crucial for the success of SMEs.

The short expert debate focused on the conditions for manufacturing EV batteries in Europe. According to the discussions at this workshop, Europe has clear competitive strengths particularly in the domains of standards, quality, system engineering, and exchangeability. Also, neither the cost of labour nor the availability of materials is considered to be critical. It was proposed that the European Union, in order to prevent market failure, makes available significant loans for the establishment of cell and battery manufacturing facilities. Regarding standardization in particular it was also said that in the past regulation has sometimes been used to protect indigenous industries in Europe and to hinder foreign competition. However it

⁷ CEN/CENELEC Focus Group on European Electro-Mobility, Standardization for road vehicles and related infrastructure. Report in response to Commission Mandate M 468 concerning the charging of electric vehicles, 2011.

could also work against them if non-European companies are quicker and better at responding to new rules and regulations.

Conclusions and Closing Remarks

In his closing remarks, **Dirk Beernaert**, Head of Unit Microsystems of the European Commission's DG Infso, confirmed that electric mobility would be very high on the political agenda in Europe, however its implementation in specific measures would still be under discussion. Referring to the report of the High Level Group Key Enabling Technologies (KET) where different KETs had been defined, Mr. Beernaert pointed out that the EV battery topic incorporates multiple KETs including advanced manufacturing systems. He also gave a brief outline of Horizon 2020: By a 46% budget increase compared to the current period (2007-2013) with a total amount of 80 billion EUR the Multiannual Financial Framework (2014-2020) is intended to give a new momentum for R&D&I in Europe. Horizon 2020 will concentrate on three priorities: Excellent science, industrial leadership and societal challenges. For the ICT topic, 4 billion EUR are indicated within the science pillar and 8 billion EUR for industrial leadership which includes the strategic investments in key technologies, fostering innovation in SMEs and attracting private financing. Of the 36 billion EUR (ICT: 4 billion EUR) proposed for the societal challenges pillar, about 7.7 billion EUR are indicated for Smart, green and integrated transport. Parliament and Council negotiations on EU budget 2014-20 including overall budget for Horizon 2020 are ongoing. By the end of 2013 legislative acts by Parliament and Council on Horizon 2020 will be adopted, and on 1 January 2014 Horizon will start by launching the first calls.

Concluding the workshop, Mr. Beernaert raised a series of questions from to the industrial community:

- How can the EC help for industrial take-up of the EV battery systems industry in line with the battery price erosion and performance increase roadmap?
- What can be solutions in line with KET recommendations (prototyping or test facilities, standards, educational issues, globalisation strategies, etc.)?
- Do we need new players? Do we have the full value chain? Have we access to all raw materials? Are there opportunities for new companies?
- What is the role of Member States and Regions and how can it be coordinated?

Mr. Beernaert asked actors from industry and research to convince decision makers about the added value to have battery manufacturing in Europe, the employment and environmental impact, the need for a "common" European roadmap for innovation and a European level strategy for implementation, as well as for a blueprint for concrete action. He concluded stating: "Europe, the Commission, Horizon 2020 is willing to help but need evidence and commitment from industry, MS and Regions. Horizon 2020 is not business as usual."

4.) Preliminary Results of the Workshop

In view of the presentations give and the debates held at this workshop, the following field of action can preliminarily be stated:

- **Research, development and innovation:** European researchers recently acquired significant new knowledge in the domains of novel electrochemical battery cell systems (e.g. Li-air), battery system integration (e.g. BMS at cell level), and the manufacturing, integration and recycling of EV batteries. Research, development and innovation in the domain of these KETs needs to be further strengthened, not just through dedicated funding programmes, but particularly through the establishment of world-class joint research facilities gathering Europe's most excellent battery researchers from both academia, industry and SMEs, and providing them with effective and efficient access to advanced

equipment and expertise for fabrication, characterization, prototyping and testing. Opportunities for quickly scaling-up production of promising new systems shall be an integral part of this concept. Either one central facility or a highly integrated network of a very few labs with complementary competences should be established and funded as public-private partnerships.

- **Mass Production:** The local manufacturing of batteries in Europe will be crucial for promoting electric mobility as a viable technology path, and thus to prepare the European automotive industry for global competition. Despite the obvious need for more research, development and innovation, first generations of required manufacturing technologies for cells and systems are mature and available already today, however their cost effective application requires large scale and risky investments which none of the European OEMs or suppliers is willing to do of its own accord. Following best practices from overseas, the imminent market failure can be avoided if significant financing is made available to OEMs and suppliers for the establishment of large-scale cell and pack manufacturing facilities as public loans from the community budget, e.g. through the European Investment Bank. In return, the consortia could be expected to generate added value by making the required adjustments to their value chain and to generate demand for EV batteries “made in Europe”, e.g. by agreeing on harmonized pack designs, interfaces, warranty procedures, exchange systems, recycling procedures and 2nd use business models.
- **Standardization:** Needed innovation regarding the electrochemical configuration of cells shall not be hindered by any too early attempts of standardization or harmonisation. However, there are good reasons for creating standards and regulations at the level of the pack design, ranging from the opportunity to create new electric vehicle value chains by modularization to design to facilitation of recycling and 2nd use. Related recommendations by the CEN/CENELEC Focus Group should be further elaborated and promoted within Europe and at a global level.

All these actions have to be based on a careful understanding of risk and opportunities and need to be adjusted to the worldwide developments and to the specific needs and strengths in the various regions in Europe. These should be assessed jointly by the involved industries, academic institutions and public authorities in Europe, and a way towards their implementation in the context of Horizon 2020 and involving the European member states should be laid out in the form of a detailed European EV Battery roadmap, which could be developed in the context of the stakeholder consultation processes of the PPP European Green Cars Initiative.

The agenda and all presentations of this workshop can be accessed at www.ict4fev.eu/workshops/joint-ec-eposs-ertrac-expert-workshop-2011-on-battery-manufacturing

Rapporteurs:

Gereon Meyer (VDI/VDE-IT / Coordinator of ICT4FEV), Beate Müller (VDI/VDE-IT)
Gonzalo Hennequet (Renault / Coordinator of CAPIRE)
Jesus Monclus Gonzalez (CDTI)

Annex: Invitation Letter and Agenda



European Green Cars Initiative



Dear Sir or Madam,

It is our great pleasure to invite you to attend the

Joint EC / European Green Cars Initiative PPP Expert Workshop 2011
Europe's Strengths, Competencies and Job Opportunities
in Electric Vehicle Battery Manufacturing

which will be held at the premises of the Fondation Universitaire, Rue d'Egmont 11, 1000 Brussels (Belgium), on 7 December 2011.

In July the High Level Group on Key Enabling Technologies (KET) delivered key recommendations for a more competitive European industry. "Europe has to transfer their excellent research results faster into the market and has to invest more in applied research, (large) field demonstration activities, prototyping lines and manufacturing. European policies and programs should create a global competitive environment for European companies to compete world wide and should facilitate more investments in the strategic field of KETs, their interfacing and their integration in innovative products".

Breakthrough in battery research, technology and manufacturing, together with advancements in energy supply and energy management are one of the most determining factors for the future market uptake of electric mobility in the smart cities of tomorrow. Keeping these competencies in Europe is essential for the competitiveness of the European automotive industry and their suppliers and will generate large spill over effects in other industrial fields.

This joint workshop of the European Commission and two European Technology Platforms involved in the Public Private Partnership European Green Cars Initiative, ERTRAC and EPoSS, will discuss current and future European activities and policies related to research, development, manufacturing and innovation in the domain of batteries for the electric vehicle. First results of collaborative research projects on batteries funded under the European Green Cars Initiative will be presented either orally or on posters. Furthermore, relevant pilot actions for battery cell and system manufacturing from selected regions in Europe will be reviewed. Opportunities for Europe to create added value by promoting joint research, linking pilots, and establishing new innovation flagships will be considered. And finally, the workshop should provide concrete recommendations for future R&D&I and supporting activities, in line with the KET recommendations and in preparation of Horizon 2020, the future common framework for research and innovation.

The invited experts include the participants and coordinators of European collaborative research projects on batteries, leaders of major pilot activities for battery manufacturing, representatives of companies from the field of energy storage, cell and battery technology as well as research institutions, public authorities and all involved Directorates General of the European Commission. We look forward to your active participation and an interactive discussion. A report shall be made available to the community after the workshop. Please refer to the enclosed document for the draft agenda.

This workshop is prepared on behalf of the European Commission and Public Private Partnership European Green Cars Initiative by the Coordination Actions "PPP Implementation for Road Transport Electrification" (CAPIRE) and "Information and Communication technologies for the Full Electric Vehicle" (ICT4FEV), and supported by the Spanish Centre for Industrial Technological Development (CDTI).

Please confirm your participation by **Wednesday, 30 November 2011** by completing the online registration form at the website www.ict4fev.eu/events/workshop-battery-manufacturing. Note that participation is free of charge and by invitation only, travel costs will not be reimbursed. Additional experts may apply for acceptance by completing the registration form; however their participation needs to be confirmed by the organizers.

We are looking forward to receiving your registration. For any questions you may have regarding the agenda, preparation or organization of the workshop feel free to contact Dr. Gereon Meyer, the coordinator of ICT4FEV at VDI|VDE-IT (ict4fev@vdivde-it.de, +49 30 310078 155).

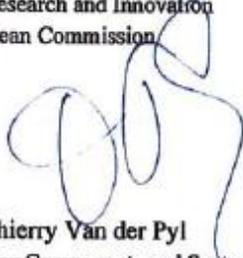
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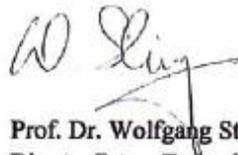
Dr. Herbert von Bose
Director Industrial Technologies
DG Research and Innovation
European Commission



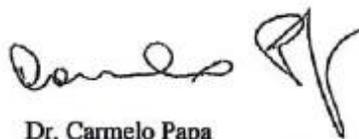
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Chair Advisory Group Green Cars Initiative PPP



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Joint EC / European Green Cars Initiative Workshop 2011
Europe's Strengths, Competencies and Job Opportunities
in Electric Vehicle Battery Manufacturing

Fondation Universitaire, Rue d'Egmont 11, 1000 Bruxelles, 7 December 2011



- 9:30** **Opening**
Welcome
Wolfgang Steiger, Volkswagen / Chairman ERTRAC and EGCI Advisory Group
Keynote EC / DG RTD
Herbert von Bose, Director Industrial Technologies, European Commission
Keynote Spain
Xabier Garmendia, Vice-Minister of Industry and Energy, Basque Government
Report from Japan
Setsuko Wakabayashi, NEDO
- 11:00** **Coffee Break**
- 11:30** **Session 1: Strengths and Competences**
Chairperson: Jérôme Perrin, Renault (France)
GREENLION, *Oscar Miguel Crespo, CIDETEC (Spain)*
ELIBAMA, *Jérôme Perrin, Renault (France)*
Smart LIC, *Sven Rzepka, Fraunhofer ENAS (Germany)*
SuperLIB, *Bernhard Kortschak, AVL (Austria)*
ESTRELIA, *Ewald Wachmann, Austriamicrosystems (Austria)*
LABOHR, *Elie Paillard, University of Münster (Germany)*
Discussion (*all*)
- 13:00** **Lunch / Posters Projects on Cell Materials Research**
- 14:00** **Session 2: Manufacturing and Regional Dimension**
Chairperson: Andreas Dorda, A3PS (Austria)
Development of Battery Cell Manufacturing Technologies
Claudio Lanciotti, KEMET (Italy)
Nissan EV Batteries Manufacturing Plant
Francisco Carranza-Sierra, Nissan, (U.K.)
Activities on advanced battery for electric vehicles in CEGASA
Igor Cantero, CEGASA (Spain)
Recycling of NiMH and Li-ion batteries
Jan Tytgat, Umicore (Belgium)
Discussion (*all*)
- 15:30** **Coffee Break**
- 16:00** **Session 3: Coordination and Standardization**
Chairperson: Pietro Perlo, IFEVS (Italy)
Standardization Issues related to Batteries
Ziva Patir, Better Place (Israel)
Crucial Role of the Full Value Chain and SMEs in Battery Manufacturing
Maria Luisa Soria, SERNAUTO (Spain)
Creating links between EU and MS funding activities
Bernard Duhem, ERANet+ Electromobility
Discussion (*all*)
- 17:00** **Conclusions and closing remarks**
Dirk Beernaert, Head of Unit Microsystems, European Commission

Posters: Projects on Cell Materials Research

AMELIE

APPLES

AUTOSUPERCAP

ELECTROGRAPH

EUROLIION

HELIOS

LABOHR

SOMABAT

Coordination and Rapporteurs:

Gereon Meyer (VDI/VDE-IT / ICT4FEV)

Gonzalo Hennequet (Renault / CAPIRE)

Jesus Monclus Gonzalez (CDTI)



Annex: Participants

Firstname	Lastname	Organisation	Country
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