



EPoSS Draft
FP7 ICT Work Programme 2011
for the Green Cars Initiative
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Objective GCI-ICT 2011

Smart Energy Storage Systems and Grid Interfaces for the FEV

Smart Systems will enable the full electric vehicle by providing aware, caring, safe and robust means of power and energy routing between accumulator cells, battery packs, motors and power grids. Therefore, the two major focus topics of the ICT work programme 2011 to the Green Cars Initiative are the energy storage manager and the smart grid interface.

Part A: Energy Storage Manager

Integration of battery cells into a battery pack is an important issue concerning safety, cost, manufacturability, diagnostics, maintenance, repair and recyclability. Solutions for these challenges shall be found in both passive measures and active measures. Furthermore, there is a need to complement fundamental R&D on battery cells by measures for bringing down the cost of already mature battery technology and integrating these into the fully electric vehicle. This requires to improve the interlinks between the new FEV battery and energy storage value chains.

Target outcomes:

a) Smart battery management

Passive measures include packaging, thermal management, mechanical/electrical interconnects, interfaces and active measures are state of health/state of charge monitoring and adaptive control, such as smart systems for the equilibration of battery cells, battery management and electrical management of accumulators. A special focus shall be put on hybrid energy storage systems combining e.g. supercapacitors and batteries as well as mechanical/electrical interconnects and communications interfaces integrated into storage systems.

b) European FEV Battery Advisory Board

The gap between fundamental research and manufacturing in the domain of batteries for the FEV needs to be bridged. Solutions may be found in the establishment of a small number of pilot facilities for energy-power storage systems. This calls for a well balanced and coordinated approach of all companies, organisations and administrative entities related the involve value chains, all relevant European member states and all Directorates General in charge of the topic. Given the strategic importance of the FEV battery for the competitiveness of the European automotive industry the nucleus for such activity, e.g. a dedicated advisory board, shall be created.

Part B: Smart Grid Interface

Interfaces combining transfer of electricity and data with smart metering capabilities can ensure the connection of electric vehicles to renewable sources and will in the future even enable bidirectional operation, i.e. the energy stored in batteries is fed back into the grid for a transient coverage of peak demand or in order to increase the stability of the grid (power regulation). ICT solutions taking into account user needs and tariff structures will be required to enable trading of electricity and raise user acceptance. Given the different pace of innovation on the vehicle and grid sides, standards that anticipate future smart grid capabilities need to be developed. Furthermore, there is a need for business models and best practices for the implementation of the vehicle-to-grid (V2G) concept.

Target outcomes:

c) Smart vehicle-to-grid interfaces

On-board and off-board devices for the connection of the vehicle to the grid that enable smart metering, controlled charging and particularly the bidirectional flow of energy and power by integrating means of safe, secure, loss-free and convenient transfer of electricity and data. Particular focus shall be put on fast charging, contact-less charging and charging en route. Issues of electro-magnetic compatibility, robustness, reliability and health impact need to be carefully considered.

d) Adaptive charge and discharge management

Control strategies and algorithms for the charge and discharge management of the electric vehicle's energy storage systems that predict and adapt to the energy needs and preferences on both the user, the vehicle's battery and the grid sides as well as to tariff structures and trading options. These require real time communication between the vehicle, the grid control center and the user. Functions to be implemented include monitoring of energy flows, seamless interaction, remote control, en-route navigation for the available charging spots in reach. Preferred solutions are independent of a specific platform and allow user interaction through e.g. web portals and smart phone apps.

e) Assessment of economic and environmental impact

Studies evaluating and predicting the opportunities for a convergence of renewable energies and electromobility through smart interfaces and V2G that adapt to the fluctuating supply of such sources. Taking into account the financing models of utilities and fleet operators as well as car owners, business cases for V2G shall be developed. A special focus shall be put on life cycle cost of batteries, value of grid stability and user patterns, and recommendations shall be derived for tariff structures, anticipative standards and dedicated hardware that ensures the use of renewable energy for charging as well as trading of energy.

Expected impacts:

- Strengthen global competitiveness of the European automobile, ICT and battery sectors and create jobs by innovation and early market launch of key components of the FEV,
- Fight climate change by convergence of to the electric drive train with power from renewable and non-carbon sources like wind and solar.
- Utilize the potential of ICT solutions and smart systems as enabling technologies of key functionalities of the full electric vehicle.

Funding Schemes: a,c,d) STREP, IP; b,e) CSA

Indicative Budget: 30 Mio €