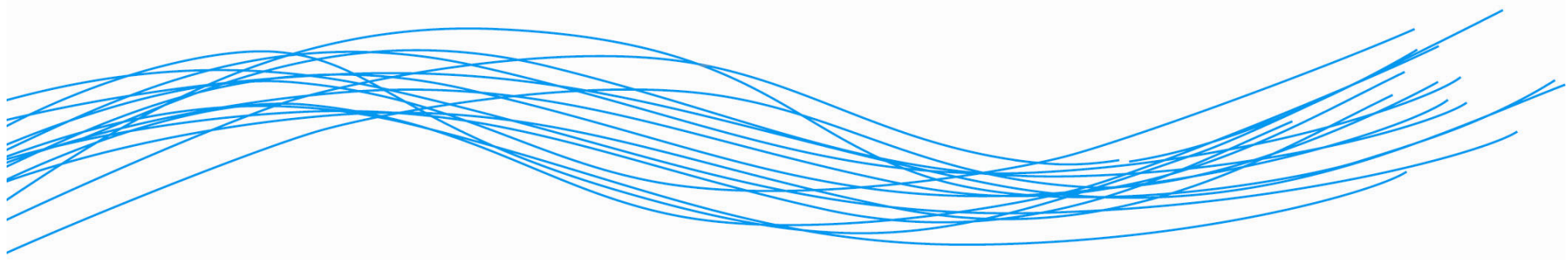




European Green Car Initiative Sustainable Surface Transport WP



**Results from the first EGCI call
Electric Vehicles and Heavy Duty Vehicles topics
in the 2011 call**

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- **The research part of the EGCI has started at full speed with the launch of the first specific calls**
 - ▶ One in DG MOVE
 - ▶ One in DG INFSO
 - ▶ Two of them were in our Directorate general

- **The 2010 DG MOVE call**

- ▶ The call targeted wide scale demonstrations of electric vehicles
- ▶ Not only vehicles, but mainly infrastructure will be covered
- ▶ Standardisation, business models and user acceptance very important aspects
- ▶ Strong links expected both with national and regional demos and important running projects, such as the recently started ones by the RTD-Energy directorate exploring the potential of batteries on board EVs to serve as support for the electricity grid

- **The joint call on electrochemical storage (1)**
 - ▶ Four directorates involved, jointly developing the call and evaluating the proposals
 - ▶ A remarkable success, attracting 25 high level proposals of which 7 have been funded
 - ▶ A clear trend in several proposals was to develop advanced metal air battery, aiming at developing chemistries capable of delivering more than double the range of the best current Lithium cells for a given weight. One such proposal was selected.



- **The joint call on electrochemical storage (2)**

- ▶ Four selected proposals address in different ways the challenge of significantly improving the performance of lithium based cells, while improving cost, safety and environmental features (getting away from costly and harmful materials like nickel, cobalt, organic electrolytes...)
- ▶ In one cases the objective was, interestingly, to extract in the recycling phase active electrochemical compounds instead of just cobalt and lithium
- ▶ Two of the selected projects, finally, propose to improve the performance of supercapacitors, to be used either instead of batteries (in hybrids) or together with high energy cells to "protect" them. One of these projects will look into the use of graphene to get a breakthrough in supercap performance.



- **The 2010 Transport directorate call**

- ▶ A total of 49 proposals have been submitted. Two were deemed out of scope, 17 of the remaining 47 have been selected (plus one in the reserve list).
- ▶ Some trends can be already extracted, looking at the main technical topics
- ▶ **Electric machines**
 - ◆ Large interest in this topic, 11 proposals received
 - ◆ The strongest interest was for very compact, innovative permanent magnet motors with work on reducing strategic materials content and optimised design for production to reduce costs.
- ▶ **Electric Auxiliaries**
 - ◆ Only three proposals received
 - ◆ Most very good ones, looking at cooling and heating, clearly the dominating issue on auxiliaries for pure EVs for the proposers.
 - ◆ One dealing also with PV integration for energy harvesting

- **The 2010 Transport directorate call**

- ▶ **ICEs for range extender/plug in hybrid applications**

- ◆ Good interest (7 proposals), but two diametrically opposed trends
- ◆ On one end, application of traditional engines
- ◆ On the other very innovative applications with no or little previous work and therefore high risk
- ◆ One proposal selected, plus one in the reserve list

- ▶ **Battery integration**

- ◆ Good number of proposals (six), looking at how better to physically integrate both fixed and removable batteries.
- ◆ Mostly interest in crashworthiness to protect this very valuable item
- ◆ Thermal control another point of interest
- ◆ Battery swap technology also well covered

- **The 2010 Transport directorate call**

- ▶ **Advanced vehicle architectures**

- ◆ The highest number of proposals, 14 in all
- ◆ Very wide topic description, open to both system level concepts (new vehicles) and detailed technologies (lightweight materials, aerodynamics, EMC issues, crashworthy concepts etc)
- ◆ Good proposals of both types received, and some integrating both general and detail aspects
- ◆ Some looking at a wide level exploration of possible vehicle architectures
- ◆ Small urban vehicles dominating as a whole
- ◆ Some in the light vehicle (quadricycle) category, where crash requirements are less stringent

- **TOPIC – GC.SST.2011.7-1**

Specific safety issues of electric vehicles

- ▶ **Objective:** The presence of high voltages and potentially hazardous chemicals and the absence of engine noise pose specific problems to EVs. The expected impact of the first subtopic should be technologies and procedures that avoid additional casualties to the current level due to electrocution risks. The second subtopic should produce systems and technologies capable of giving effective warning to vulnerable users at a sufficient distance while maintaining the advantages of electric technologies in terms of improving the current road noise environment.
- ▶ **Coverage:**
 - ◆ Innovative topologies and concepts (including fault tolerance or mitigation) for various applications.
 - ◆ Safe plug-in/re-charging, prevention of misuse/abuse, protection against fire and electric shocks during maintenance or after a crash
 - ◆ Acoustic perception of the FEV, raising awareness of vulnerable users including the application/adaptation of existing pedestrian protection systems (active safety) to the raised needs.
- ▶ **Funding schemes:** CP Small/Medium scale – Level 1

- **TOPIC – GC.SST.2011.7-2**

Integrated thermal management

- ▶ **Objective:** develop cost efficient and industrially viable integrated thermal systems for long range, reliable and comfortable electric vehicles when no waste heat source is available.
- ▶ **Coverage:**
 - ◆ Improvement of the efficiency of the thermal control of the energy storage system, independently of the actual ambient temperature.
 - ◆ Optimization of the impact of the thermal comfort of the users on energy consumption through innovative, light, cost efficient, electronically controlled materials and their integration aspects (new insulating materials, active glazing, local heating, etc.).
 - ◆ Development of cost effective thermal management systems of the power train during charging, operation of the vehicle as well as during parking periods.
 - ◆ Cooling aspects of the electric motor in combination with a ICE range extender or auxiliaries.
- ▶ **Funding schemes:** CP Small/Medium scale – Level 1

- **TOPIC – GC.SST.2011.7-3**

Efficient long distance transport – waste heat recovery

- ▶ **Objective:** The development of waste heat recovery systems and, in particular, the associated components, such as the expander (Rankine cycle), advanced heat exchanger and cooling system, including the investigation of more advanced waste heat recovery systems based on thermodynamic cycles (organic/non-organic) or other advanced technologies, excluding thermoelectric devices. A minimum 10% fuel consumption reduction at vehicle level (thus including the effect of any weight or performance penalties) should be demonstrated with an initial cost increase recoverable in a 5 year period
- ▶ **Coverage:**
 - ◆ System design for the thermodynamic cycle
 - ◆ Development of expanders, advanced heat exchangers and working fluids.
 - ◆ Cooling system and integration, arrangement at the power train and vehicle.
 - ◆ Development of simulation methods for future adaptation of such a system on the various power trains for heavy duty trucks.
- ▶ **Funding schemes:** CP Small/Medium scale – Level 1



DG RTD

SST 2011 Call

Transport Theme

- **TOPIC – GC.SST.2011.7-9**

Efficient long distance transport – future power train concepts (includes: advanced combustion and after-treatment)

- ▶ Objective: further reduction of the fuel consumption of heavy duty trucks (a 15% efficiency improvement from the power train, based on Euro 5 power train on the WHTC and the ETC) while anticipating the needs deriving from further expected steps of regulation (Euro VI emission limits with no increase in the NO₂ share of the total engine-out NO_x, confirmed with a 1.25 multiplier for in-use compliance).
- ▶ Coverage:
 - ◆ Engine innovation will include a suitable combination of :
 - Down-sizing / down-speeding with advanced turbo-charging.
 - Development of a new turbo charger system with higher pressure ratio and wider area of high efficiency.
 - Friction reduction: piston, crankshaft camshaft and auxiliaries (oil and water pumps).
 - Faster combustion (e.g. high PCP, low EGR rate, VVA), supported by advanced injection strategies, using closed loop functionality as well as high thermal efficiency.
 - Advanced air control systems for internal EGR and effective compression ratio management.
 - ◆ After-treatment innovation will include a suitable combination of:
 - Reduced thermal losses, with a possible integration of improved exhaust after treatment systems for cold start and transient conditions, considering new catalytic materials.
 - Advanced NO_x after-treatment systems: SCR (Selective Catalytic Reduction) systems (e.g. new catalytic materials) and combinations with NO_x trap and particle filters/oxicat, with an additional aim of minimizing the NO₂ fraction in NO_x emissions.
 - Heat management for the after-treatment system.
- ▶ Funding schemes: CP Large scale – Level 2





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Transport Theme

- **TOPIC – GC.SST.2011.7-10**

Architectures of Light Duty Vehicles for urban freight transport

- ▶ Objective: novel electrified LDV concepts and solutions (conversions are excluded) to enable efficiency gains for mobility and the transportation of goods in the urban environment, e.g. last mile delivery and other applications such as the powering of tools. The development of complete vehicle concepts is envisioned and a strong industrial participation is recommended. Higher energy efficiency (at least 40% reduction in terms of primary energy consumption) should be demonstrated with respect to best of class vehicles in the same category, while achieving a range adequate to the typical daily urban mission
- ▶ Coverage:
 - ◆ Usability in the urban environment.
 - ◆ Optimized structural layout aiming at improving weight and crashworthiness.
 - ◆ Modularization of subsystems and standardization of components for low cost and high efficiency
 - ◆ The above while considering safety, EMI/EMC and radiation health impact issues, maintenance and repair, while exploiting the significant opportunities offered in terms of layout and packaging, functionality, and construction
- ▶ Funding schemes: CP Small/Medium – Level 2





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Transport Theme

- **TOPIC – GC.SST.2011.7-7**
Advanced eco-design and manufacturing processes for batteries and electrical components
- **TOPIC – GC.SST.2011.7-8**
ERA-Net Plus 'Electromobility'
- **All logistics/urban topics**
- **DG INFSO 2010 topics**

are detailed in the following presentations



- **Thank you for your attention!**
- **Questions?**