Electrification of Road Transport

European Roadmap
of the Ad Hoc Industrial Advisory Group
European Green Cars Initiative

Günter Lugert

SIEMENS
Corporate Technology
Global Technology Leader
Actuators & Drive Systems
guenter.lugert@siemens.com

European Platform on
Smart Systems Integration
Chairman Executive Board
www.smart-systems-integration.org

www.ertrac.org
PPP European Green Cars Initiative

- PPP in the European Economic Recovery Plan (Factories of the Future, Efficient Buildings, Green Cars)
- Total Budget: **5 bn Euro** = 4 bn Euro Loans + 1 bn Euro RTD
- PPP of industry, member states and EC (50% funding)
- Horizontal activity (DGs Research, Infso, TREN, ENV, Enterprise)
- Implementation through **FP 7** (2010-2013)
- Major focus on **electrification** (aprx. 2/3 of budget)
  - Climate protection (with electricity from renewable sources)
  - Energy security (Diversification of primary energy sources)
  - Zero local emissions mainly
  - Global **competitiveness** of the EU automotive industry
Ad Hoc Industrial Advisory Group

Role:
- **integration** of all relevant stakeholders and EC services
- **strategic dialogue** between Commission and industry
- **implementation** of the Green Cars Initiative as a PPP

Members (represent ETPs):
- AVL
- Bosch
- Continental
- ECT
- FEV
- Fiat Research Center
- Iberdrola
- IFP
- KU Leuven
- Procter & Gamble
- PTV
- Renault
- Ricardo

- Schachinger
- Siemens
- Valeo
- VDI/VDE-IT
- Volkswagen
- Volvo
- DG RTD
- DG Infso
- DG TREN
- DG ENV
- DG Enterprise
- EIB

[www.green-cars-initiative.eu](http://www.green-cars-initiative.eu)
ICT solutions, smart components and Systems which enable the full electric vehicle

- by providing aware, caring and robust means of power and energy routing between accumulator cells, battery packs, motors and the power grid
- by applying adaptive control and power electronic converters to electric motors and wheels
- by actively enhancing the safety of road transport based on batteries and lightweight vehicles, and
- by making the driver aware of the availability of energy and power and of the resulting restrictions in terms of range and comfort.

(Joint EC/EPoSS Workshop Smart Systems for the FEV/ 2008 CSA´s CEPoSS / 2009 and IRISS / 2011)
Technology Challenges

• **Energy Storage Systems**  
  (cost, performance, lifetime, safety)

• **Drive Train Technologies**  
  (energy recovery, range extenders)

• **System Integration**  
  (energy efficient interplay of components)

• **Grid Integration**  
  (charging, metering, renewables, V2G)

• **Safety**  
  (crashworthiness, HV, emergency)

• **Transport System Integration**  
  (road infrastructures, intermodal use)
Roadmap Electrification

drafted in 2009 by
ERTRAC + EPoSS + SmartGrids
Task Force Electrification
Drafted by
ERTRAC + EPOSS + SmartGrids
Task Force Electrification

Roadmap Electrification

Transport System Integration

- Explore Potential of ITS for Energy Efficiency
- Provide Convenient Transition Between Modes
- Apply Sensors & C2X for Autonomous Driving
- Promote Green Image of Electric Vehicles
- Develop Best Practice for Implementation of Road Infrastructure Measures Supporting Rapid Uptake
- Review Effects of Large Scale Deployment on Future Infrastructure Developments
- EU Wide Signage of Roads and Vehicles

October 2009

Research & Development
Production & Market
Regulatory Framework

Updating the Roadmap Electrification beyond 2013

1. Achievements - Have short-term goals been reached?
   • map existing projects against roadmap items of Milestone 1 (2012)

2. Filling gaps – What issues have not yet been addressed?
   • horizontal topics and support functions:
     • Simulation
     • Production Technologies
   • take inventory of existing and needed competencies

3. Future Vision – Taking the roadmap beyond 2020
   • review long-term concepts and strategies of partners
   • complement with and align to roadmaps of ETP’S
     • ERTRAC Road Transport Scenario 2030+
     • Drafts: Hybridisation, Technology and Production Concept etc.
   • define new Milestone 4 and supplement technology roadmaps according to it
3 EGCI priority areas:
• Electrification
• Long Distance Truck
• Logistics and Co-Modality
Long Distance Truck - Challenges

- Vehicle Efficiency
- Driveline Efficiency
- Driver Efficiency

A. Vehicle efficiency

1. The safe and intelligent truck (v2v & v2i)
2. Matching vehicle to operation
3. Design dimensions for optimised load capacity
4. Aerodynamics
5. Low Rolling Resistance
6. Energy Management & Efficient Auxiliaries
7. Advanced Materials and Design
Long Distance Truck - Challenges

B. Driveline efficiency
   1. Future Powertrain concepts & complete system integration
   2. Advanced Combustion and Aftertreatment
   3. Waste Heat Recovery
   4. Advanced Powertrain Control
   5. Alternative and multi-fuel capabilities
   6. Friction
   7. Hybrid Powertrain
   8. Innovative high efficiency energy conversion

C. Driver Efficiency
   1. Driver support systems
   2. Freight handling
Logistics and Co-Modality - Challenges

- City logistics
- Green hubs and green corridors
- Intelligent logistics systems, optimising e-freight

*Main objectives:*

- Improve **load factors** and the balanced use of modes of transport across the European freight transport system.
- Reduce **CO2 emissions** as well as other emissions.
- Remove **congestion**, delay and time loss.
Logistics and Co-Modality - Milestones

M. I
Milestone I (to 2015)
Setting the Targets

M. II
Milestone II (to 2020)
Building the Partnerships

M. III
Milestone III (to 2030)
Roll-out
Vehicle to the Grid Integration
Smart Systems for the EV

Multi-directional ‘flows’

Central & dispersed sources

Central power plant
Offices
Houses
Storage
Micro-turbines
Industrial plants
Virtual power plant
Wind turbine

End user real time
Information & participation

Seamless integration
of new applications

Central & dispersed intelligence

Smart materials
and power electronics

Source partly: Ronnie Belmans