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**Report on National R&D  
Programmes on  
the Fully Electric Vehicle**



Berlin, 22 August 2012

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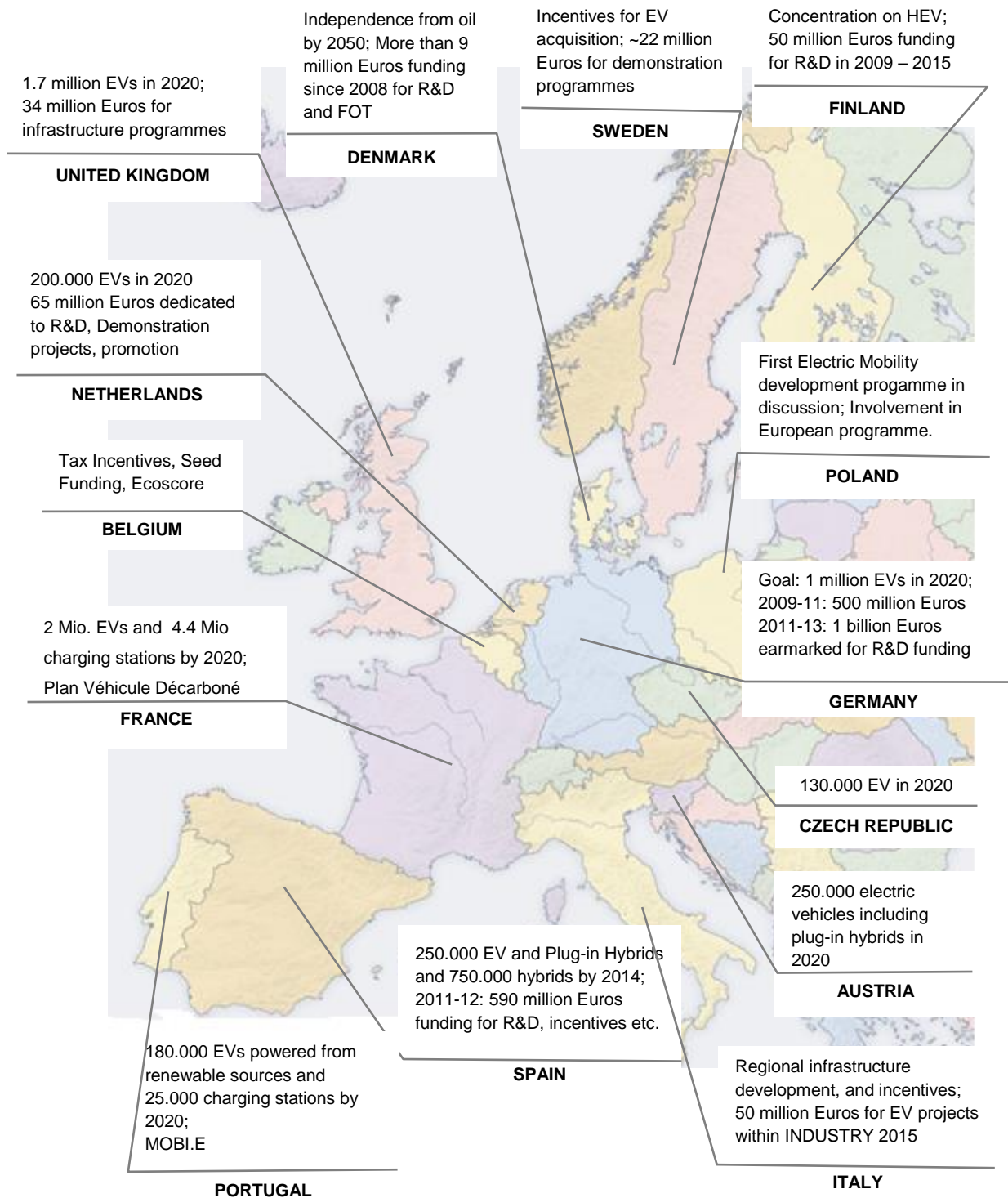
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# 1 Map of Electric Mobility in Europe



## 2 Introduction

The electrification of road transport currently is seen as one important factor for achieving goals regarding reduction in greenhouse gas (GHG) and other noxious emissions, energy efficiency and secure energy supply as well as global competitiveness. Hence, enabling technologies for electric vehicles and infrastructure will soon be strongly demanded, and therefore research & development (R&D) related to the full electrification of road transport is supported by public authorities of various countries all over the world. Information and Communication Technologies (ICT) is regarded as a key technology of the full electric vehicle (FEV) that opens new technology paths towards energy efficiency, functionality and usability that are complementary to future advances in performance of battery cell technology. A complete re-design of the FEV's electric, electronic and software architecture may even lead to the breakthroughs in cost reduction and energy efficiency which are required to turn electric mobility into a mass phenomenon.

In the past the European industry has proven its strength in both vehicle manufacturing and ICT. In order to keep this position and even amplify it, a timely, balanced and concerted focus of research and development is called for. The ICT4FEV project supports these European electrification efforts focusing especially on the ICT needed for enabling the electric vehicle. Among others, important project objectives are creating coherence between the R&D strategies for ICT for FEV of the European Union, the involved industries and the European member states and embedding the European R&D activities in the domain of ICT for FEV in the global context. The present report is listing visions, policies, legislation, R&D funding activities and relevant platforms of a number of European member states as well as for Japan, USA, China and South Korea which can be considered global key players within the electric vehicle sector. It shall serve as a source of information to support decision making regarding policies and strategies relevant for R&D for the fully electric vehicle.

The information regarding national vision, strategies, relevant organisations, platforms and programmes is gathered from a multitude of sources: A number of European member states have presented their relevant programme activities at the 2<sup>nd</sup> Workshop on R&D for the Fully Electric Vehicle held at the European Commission's DG INFSO on 11 June 2010. Some additional content has also been compiled recently by the EU-funded EAGAR project which examined, however, automotive research in general. Also, within the EU-funded CAPIRE project a similar catalogue is being prepared that concentrates on Green Cars in a broader sense. Furthermore, the Hybrid & Electric Vehicle Implementing Agreement of the International Energy Agency recently published annual reports in 2010 and 2011, where policies and research activities of the IEA member states have been assessed. This information basis was updated and completed for electric mobility projects by desk research and also information gained from personal contact to experts, particularly regarding the non-European countries Japan and USA.

## 3 The European Union

### 3.1 Vision, Policies and Legislation

Within its Europe 2020 Strategy the European Union sets the goal to reduce greenhouse gas (GHG) emissions until 2020 by at least 20% compared to 1990. The share of renewable energies in the energy consumption shall increase to 20%, and energy efficiency shall lead to a 20% cut of the overall energy consumption. The transport sector causes 26% of all GHG emission due to human activities. And of these emissions 85% are caused by road vehicles. Hence, road transport is an important factor to be addressed in order to achieve the Europe 2020 goals. To reduce CO<sub>2</sub> emissions a dedicated regulation for newly licensed vehicles was passed: The CO<sub>2</sub> emissions may not exceed 120/130g CO<sub>2</sub>/km by 2012-2015. In 2020 they shall go below 95 g CO<sub>2</sub>/km. Longer term goals related to transport were set by the Directorate General Transport of the European Commission in its 2011 white paper that aims to cut transport emission by 60% until 2050 and to shift 50% of the medium distance intercity passenger and freight transport off the road. Another 2050 vision paper was compiled by the Future Fuels Expert Group in 2011 stating that in 2050 fossil fuels should be replaced by alternative fuels. In their view, the main option to achieve this is the electrification of road transport and a shift to biofuels. This may be complemented by the use of natural gas, biomethane and LPG, with synthetic fuels from renewable sources being a bridging option.

An important step towards greener transport and particularly toward the electrification of road transport has been made by launching the Public-Private Partnership (PPP) European Green Cars Initiative and providing a funding budget of 500 Mio Euros for collaborative basic and applied R&D in the 7th Framework Programme. Within the European Green Cars Initiative the European Technology Platforms ERTRAC, EPoSS and SmartGrids have set up a continuous stakeholder consultation process consisting of workshops, roadmaps, programme recommendations and project implementation.

#### Links and References

European 2020 Strategy

[http://ec.europa.eu/europe2020/index\\_en.htm](http://ec.europa.eu/europe2020/index_en.htm)

European Transport White Paper 2011

[http://ec.europa.eu/transport/strategies/2011\\_white\\_paper\\_en.htm](http://ec.europa.eu/transport/strategies/2011_white_paper_en.htm)

Report of Future Fuels Expert Group

<http://ec.europa.eu/transport/urban/cts/doc/2011-01-25-future-transport-fuels-report.pdf>

7<sup>th</sup> Framework Programme

[http://cordis.europa.eu/home\\_en.html](http://cordis.europa.eu/home_en.html)

European Green Cars Initiative

<http://www.green-cars-initiative.eu>

## 3.2 Funding Organisations and Relevant Platforms

Research and development for electric mobility is promoted mainly by the PPP European Green Cars Initiative which aims for zero emission, safe and efficient transport. It was launched in 2008 in response to the financial crisis aiming at economic recovery and the fight against climate change<sup>1</sup>. The PPP European Green Cars Initiative has been implemented by the involved units of the Directorates General for Research (DG Research), Communications Networks, Content and Technology (DG CONNECT), which is the former DG Information Society and Media (DG Infso), Mobility (DG Move), Environment (DG Environment) as well as Enterprise and Industry (DG Enterprise). The industry has been included via the three European Technology Platforms, namely the European Road Transport Research Advisory Council (ERTRAC), the European Technology Platform on Smart Systems Integration (EPoSS), and the SmartGrids Platform. Following the definition of a Public Private Partnership of the OECD<sup>2</sup> the industry is committed to co-finance and included into the decision making processes. This has been realized by installing an Ad-Hoc Industrial Advisory Group with delegates from the three European Technology Platforms and from the Directorates General involved in the Green Cars Initiative.

A framework for multilateral cooperation and promotion of R&D regarding electric mobility among European member states does not yet exist. Some projects are jointly supported by the European Union and member states within the programmes of the Joint Technology Initiatives (JTI) on Nanoelectronics (ENIAC) and Advanced Research & Technology for Embedded Intelligence and Systems (ARTEMIS). These programmes are open for all topics and applicants from all European member states. Closely related to the ENIAC JTI is the EUREKA Cluster CATRENE (Cluster for Application and Technology Research in Europe on Nanoelectronics). Within EUREKA the member states collaboratively finance projects.

Part of the concept of the European Green Cars Initiative is the inclusion of European member states. This is put into practice by the ERA-Net Plus framework under which Electromobility+, a joint call of European national funding authorities dedicated to electric mobility was launched in early 2011. 20 projects have been selected for funding which are starting now. In addition to the activities within the FP7-programme, the European Commission Joint Research Centre (JRC) is currently conducting a number of projects related to EVs.

### Links and Reference

#### DG CONNECT

[http://cordis.europa.eu/fp7/ict/micro-nanosystems/ict-for-green-cars\\_en.html](http://cordis.europa.eu/fp7/ict/micro-nanosystems/ict-for-green-cars_en.html)  
[www.ec.europa.eu/esafety](http://www.ec.europa.eu/esafety)

#### DG Research

[http://ec.europa.eu/research/transport/road/index\\_en.htm](http://ec.europa.eu/research/transport/road/index_en.htm)

#### DG Move

[http://ec.europa.eu/transport/sustainable/index\\_en.htm](http://ec.europa.eu/transport/sustainable/index_en.htm)

#### DG Environment

[http://ec.europa.eu/dgs/environment/index\\_en.htm](http://ec.europa.eu/dgs/environment/index_en.htm)

#### DG Enterprise

[http://ec.europa.eu/enterprise/index\\_en.htm](http://ec.europa.eu/enterprise/index_en.htm)

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<sup>1</sup> A European Economic Recovery Plan. COM (2008) 800.

<sup>2</sup> "Any formal relationship or arrangement over a fixed-term/indefinite period of time, between public and private actors, where both sides interact in the decision-making process, and co-invest scarce resources such as money, personnel, facilities, and information in order to achieve specific objectives in the area of science, technology, and innovation", OECD Paris, 2005.



PPP European Green Cars Initiative

<http://www.green-cars-initiative.eu/public/>

EPoSS

<http://www.smart-systems-integration.org/public>

Smartgrid

<http://www.smartgrids.eu/>

ERTRAC

<http://www.ertrac.org/>

ENIAC

<http://www.eniac.eu/web/index.php>

ARTEMIS

<http://www.artemis.eu/>

CATRENE

<http://www.catrene.org/>

Electromobility Plus

<http://www.transport-era.net/electromobility.html>

European Commission Joint Research Centre

<http://ec.europa.eu/dgs/jrc/index.cfm?id=10>

## **Other European Organisations**

### **The European Council for Automotive R&D (EUCAR)**

The EUCAR working groups gather experts from the member companies to identify R&D needs and initiate projects. The working groups focus on the following topics: Mobility, Commercial Vehicles Forum, Powertrain, Fuels, Battery and Fuel Cell Electric Vehicles, Electrification of Vehicle Task Force, Safety, Human Vehicle Interaction, Intelligent Transport Systems, Electric & Electronics, Materials, Manufacturing and Virtual Engineering. The working group for Battery and Fuel Cell Electric Vehicles has the objective to assure the availability of competitive components and necessary infrastructure in preparation of a commercialization of electric vehicles by 2015 and a mass market-rollout by 2020.

<http://www.eucar.be>

### **The European Association of Automotive Suppliers (CLEPA)**

CLEPA aims at developing and supporting the common interest of automotive suppliers. Its R&D working group regularly gives input to the stakeholder consultations within the PPP European Green Cars Initiative, and brings forward positions regarding electric mobility jointly with EUCAR.

<http://www.clepa.be>

### **The European Association for Battery, Hybrid and Fuel Cell Electric Vehicles (AVERE)**

AVERE, founded in 1978, is a European network of various National Associations dealing with electric mobility, which represent mainly NGO's, associations, interest groups, public bodies and R&D entities rather than vehicle and equipment manufacturers or electricity utilities. Its main objective is promoting the use of battery, hybrid and fuel cell electric vehicles - individually and in fleets and for priority uses – in order to achieve greener mobility for cities and countries. The main activities to achieve these

objectives are related to dissemination, networking, monitoring, participation in European and multilateral projects, lobbying and R&D.

<http://www.aveve.org>

### **European Automotive Research Partners Association (EARPA)**

EARPA is the European association of automotive R&D organisations. It brings together independent R&D providers in the automotive sector throughout Europe. Its membership counts at present 39 members ranging from large and small commercial organisations to national institutes and universities. EARPA, as the platform of automotive researchers, aims at actively contributing to the European Research Area and the future European Framework Programmes. In this task, EARPA seeks a close cooperation with the automotive industry, the automotive suppliers, the oil industry as well as the European Institutions and the European Member States. EARPA has significantly contributed to the content of the European Green Cars Initiative through dedicated strategy papers.

<http://www.earpa.eu/>

### **EURELECTRIC**

EURELECTRIC is the Union of the European Electricity Industry. Within its mission of developing and securing a competitive European electricity industry and of promoting the role of electricity for the advancement of society, EURELECTRIC also fosters the mass deployment of electric vehicles. In this regard it especially targets the integration of the electric vehicle into the grid and related standardization issues<sup>3</sup>.

<http://www.eurelectric.org>

### **ERTICO**

ERTICO – ITS Europe represents the interests of the European stakeholders in Intelligent Transport Systems and Services (ITS). In its network ERTICO connects public authorities, industry players, infrastructure operators, users, national ITS associations and other relevant organisations. ERTICO aims to facilitate the safe, secure, clean, efficient and comfortable mobility of people and goods in Europe through the widespread deployment of ITS. Hereby, it also targets the integration of hybrid and electrical vehicles into the transport and energy network. The advancement of R&D is supported by providing a networking platform for international collaborative R&D. ERTICO is involved in deployment activities such as pilot projects and field operational test, as well as by supporting the development of standards. Furthermore ERTICO advises and informs policy makers, and raises awareness by information, promotion and dissemination activities.

<http://www.ertico.com>

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<sup>3</sup> Declaration of Standardization of EV charging, <http://www.eurelectric.org/EVDeclaration/Declaration.html>

### 3.3 Funding Programmes and Projects

#### 3.3.1 European Green Cars Initiative

A total of 1 billion Euros was announced to be made available jointly by the European Union and the industry for collaborative research projects mainly in the field of electrification, but also for developing more efficient conventional drive trains and novel solutions in long distance freight and logistics. Within FP7 four rounds of calls were launched.

##### **First Call:**

The first round of calls covered a funding budget of 100 million Euros and was published in summer 2009. It mainly focused on components and architectures of the electric powertrain, electrochemical storage applications and demonstration of electric mobility:

##### (a) Sustainable Surface Transport (SST) sub-theme of Transport theme

- GC.SST.2010.7-1. Electrical machines
- GC.SST.2010.7-2. Integrated electric auxiliaries and on-board systems
- GC.SST.2010.7-3. Optimised thermal engine development and integration
- GC.SST.2010.7-4. Smart storage integration
- GC.SST.2010.7-5. Advanced electric vehicle concepts
- GC.SST.2010.7-6. Implementing Public-Private Partnership in the 'European Green Cars Initiative'
- GC.SST.2010.7-7. Raising awareness of potential job opportunities related to the electrification of road transport
- GC.SST.2010.7-8 Green Cars - Integrated EU demonstration Project on Electromobility
- GC.SST.2010.7-9 Materials, Technologies and Processes for Sustainable Automotive Electrochemical Storage Applications

##### (b) Information and Communication Technologies (ICT) theme

- GC.ICT.2010.10-3 ICT for the Fully Electric Vehicle

##### **Second Call:**

The second call, launched in 2010 with an indicative budget of 100 million Euros, dealt with the specific energy management, stability and safety issues of the electric vehicle as well as with system integration and manufacturing of batteries, the optimization of the internal combustion engine and efficiency gains in logistics. Moreover, a dedicated budget was made available for supporting a joint call of public authorities at member states and regional level in the framework of an ERA-Net Plus:

##### a) Joint NMP, Transport and Environment Call

- GC.NMP.2011-1 Advanced eco-design and manufacturing processes for batteries and electrical components
- GC.ENV.2011.3.1.3-2 Operational guidance for Life Cycle Assessment studies of the European Green Cars Initiative

##### (b) Sustainable Surface Transport (SST) sub-theme of Transport theme

- GC.SST.2011.7-1 Specific safety issues of electric vehicles
- GC.SST.2011.7-2 Integrated thermal management
- GC.SST.2011.7-3 Efficient long distance transport – waste heat recovery
- GC.SST.2011.7-4 Urban- interurban shipments
- GC.SST.2011.7-5 Integrated intermodal traveller services
- GC.SST.2011.7-6 Capability of improving and exploiting capacity

- GC.SST.2011.7-8 ERA-Net Plus 'Electromobility'
- GC.SST.2011.7-9 Efficient long distance transport – future power train concepts
- GC.SST.2011.7-10 Architectures for Light Duty Vehicles for urban freight transport
- GC.SST.2011.7-11 E-freight solutions and supply chain management

(c) Information and Communication Technologies (ICT) theme

- GC-ICT-2011.6.8 ICT for the fully electric vehicle

**Third Call:**

The third round of calls was published in July 2011 covering aspects of the Transport and ICT themes of the 7th Framework Programme. The following topics have been called:

(a) Materials for Green Cars (NMP theme and Joint call)

- GC.NMP.2012-1 Innovative automotive electrochemical storage applications based on nanotechnology
- GC.NMP.2012-2 Innovative advanced lightweight materials for the next generation of environmentally-friendly electric vehicles  
(Joint Call with GC.SST.2012.1-1, and GC.ENV.2012-6.6.3)

Indicative Budget: 35 Million Euro

(b) Sustainable Surface Transport (SST) sub-theme of Transport theme

- GC.SST.2012.7.1-2 Smart infrastructures and innovative services for electric vehicles in the urban grid and road environment
- GC.SST.2012.7.1-3 European strategy for rare materials and their possible substitution
- GC.SST.2012.7.1-4 Modelling and testing for improved safety of alternatively-powered vehicles
- GC.SST.2012.7.1-5 Integration and optimization of range extenders on Electric Vehicles
- GC.SST.2012.7.1-6 Advanced energy simulation and testing for Fully Electric Vehicles (FEV)
- GC.SST.2012.7.1-7 Demonstration of urban freight Electric Vehicles for clean city logistics

Indicative Budget: 37.04 Million Euro

(c) Information and Communication Technologies (ICT) theme (Topics e-h)

- GC-ICT-2011.6.8 ICT for the fully electric vehicle

The following topics have been called:

- GC-ICT-2011.6.8e Electric Drives and Electric Components
- GC-ICT-2011.6.8f Integration of the FEV in the Cooperative Transport Infrastructure
- GC-ICT-2011.6.8g Functional Safety and Durability
- GC-ICT-2011.6.8h Coordination and Support Action "FEV made in Europe"

Indicative Budget: 30 Million Euro

**Fourth Call:**

On 10 July 2012 the European Commission published the fourth Round of Calls for Proposals of the PPP European Green Cars Initiative covering aspects of the Transport and ICT themes of the 7<sup>th</sup> Framework Programme.

(a) Materials for Green Cars (NMP theme)

GC.NMP.2013-1 Improved materials for innovative ageing resistant batteries

Indicative Budget: 20.00 million Euros

(b) Sustainable Surface Transport (SST) sub-theme of Transport theme

GC.SST.2013-1 Feasibility analysis and technological development of on-road charging for long term electric vehicle range extension

GC.SST.2013-2 Next generation electric motors

GC.SST.2013-3 Future light urban electric vehicles

GC.SST.2013-5 Configurable and adaptable truck

GC.SST.2013-6 High efficiency energy conversion for future heavy duty transport

GC.SST.2013-7 Technical and operational connectivity in intermodal freight transport

Indicative Budget: 38.95 million Euros

GC.SST.2013-4 Demonstration of electric buses as urban public transport

Indicative Budget: 25.00 million Euros

(c) Information and Communication Technologies (ICT) theme

GC-ICT-2013.6.7 Electro-mobility:

GC-ICT-2013.6.7a Advanced System Architecture for FEV

GC-ICT-2013.6.7b Comprehensive Energy Management

GC-ICT-2013.6.7c Coordination and support actions

Indicative Budget: 40 million Euros

Information on the calls can also be found on the website of the European Green Cars Initiative:

<http://www.green-cars-initiative.eu/funding/open-fp7-calls> or on the Participants portal of FP7:

[http://ec.europa.eu/research/participants/portal/page/fp7\\_calls](http://ec.europa.eu/research/participants/portal/page/fp7_calls)

## **Projects**

Since the launch of the European Green Cars Initiative more than 60 projects<sup>4</sup> have been started. The projects cover a wide area of electric vehicle related research and development topics. All technology fields mentioned in the European Roadmap Electrification of Road Transport are addressed: Energy Storage Systems, Vehicle System Integration, Drive Train Technologies, Safety, Grid Integration, and Transport System Integration. Table 1 relates the 60 projects of the European Green Cars Initiative, the 4 projects from ENIAC and ARTEMIS and 1 electromobility related project of CATRENE to the technology fields.

R&D of energy storage systems receives much attention since range and acquisition costs of the electric vehicle have significant impact on user acceptance. The high acquisition costs are to a large amount determined by the battery. The numerous projects concerning energy storage range from research on Li-Ion batteries to concepts of battery integration into the vehicle structure or easy battery swap. Besides battery technology, the field of energy storage encompasses important topics like research on supercapacitors and development of battery management systems. Another issue is related to the interface to the grid and grid integration.

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<sup>4</sup> Brochure „Project Portfolio European Green Cars Initiative“

Technology Field	Projects			
<b>R&amp;D Energy Storage Systems</b> (21 Projects)	AMELIE APPLES AUTOSUPERCAP EASYBAT eLCAr ELECTROGRAPH ELIBAMA ESTRELIA EUROLIION	GREENLION LABOHR NECOBAUT OpEneR OPERA4FEV OSTLER SmartLIB Smart-LIC	SOMABAT SMARTBATT STABLE SuperLIB	
<b>R&amp;D Drive Train Technologies</b> (15 Projects)	AUTOMICS AVTR COSIVU E3Car* E-VECTOORC CASTOR	FUEREX HEMIS Hi-Wi MOTORBRAIN* ODIN OPTIMORE P-Mob	POLLUX <sup>~</sup> Wide-MOB	
<b>R&amp;D System Integration</b> (22 Projects)	ASTERIX DELIVER ECOSHELL eFuture eLCAr E-Light Elva	EMERALD eVADER Evolution FURBOT ICE ID4FEV MAENAD Mobility 2.0	OPTIBODY OSTLER P-Mob POLLUX <sup>~</sup> SMARTOP V-FEATHER WIDE-MOB	
<b>R&amp;D Grid Integration</b> (9 Projects)	e-DASH EMERALD Green Emotion	IoE <sup>~</sup> OpEneR P-Mob	PowerUp SmartV2G UNPLUGGED	
<b>R&amp;D Transport System</b> (5 Projects)	eCo-FEV Ecogem EMERALD		GreenEmotion PICA V	
<b>R&amp;D Safety</b> (6 Projects)	ECOSHELL E-Light EM4EM **	EM-Safety eVADER	SafeEV WIDE-MOB	

**Table 1** Electric mobility projects that started under the European Green Cars Initiative and the related programmes ENIAC (\*) ARTEMIS (~) and CATRENE (\*\*) sorted to the technology fields of the European Roadmap Electrification of Road Transport.

A major challenge is the development of new vehicle architectures and ICT-platforms as well as the provision of design and development tools tailored to the requirements of the electrified vehicle. Enhancing the efficiency of the propulsion system is a directly related issue. In the various projects propulsion systems are being fundamentally reconsidered. Some relevant keywords are: integration of propulsion components into the vehicle, multi-propulsion systems, light materials and novel magnetic

materials for propulsion components, ECU and software. Furthermore, highly efficient range extender units, possibly with multi-fuel ability, shall increase the range limit set by the battery.

Other approaches to heighten energy efficiency are lightweight construction, minimising the demand of auxiliaries, energy harvesting by recuperation, waste heat recovery and solar power. Furthermore, intelligent systems for driver assistance are expected to lead to energy efficient routes and enhanced driver awareness for energy efficient driving.

Safety is another focused topic. Besides safety, issues arising with new vehicle concepts, active safety measures are strongly researched. But also the integration of electrified vehicles into the transport system, as well as the protection of vulnerable road users and the heightening of the safety within the entire transport system are investigated. For example driver assistance systems and cooperative driving based on car2x are expected to finally lead to zero fatalities in road traffic.

Although passenger cars have been concentrated on, various projects work on propulsion systems, concepts and designs specifically for light duty vehicles.

In a more general perspective, changes in the labour market and in the demand for skilled personnel are being addressed, as well as the coordination of existing regional and national pilot projects for the deployment of electrified cars.

### **Links to Projects**

<http://www.green-cars-initiative.eu/projects>

### **3.3.2 Electromobility+**

Using the instrument of ERA-NET Plus, European scientific competences shall be brought together on a trans-national level. Aim is to enable national and regional public authorities to jointly support research projects. Thus, at least 5 partners from 5 countries have to participate in a project. The possibility of additional European funding exists. Within the Electromobility<sup>+</sup> Call that ended in March 2011 20 M€ funding have been earmarked from national and regional funding authorities. The European Commission planned an additional budget of a maximum of 10 M€.

The transnational call was structured into 5 topics:

- Energy and environmental policy approach
- Usage patterns, economic models, actors involved
- Technical dimensions of the recharging systems
- Testing, trials and normative standards
- Technology based Innovation

The involved countries/regions are: France, Germany, The Netherlands, Austria, Finland, Norway, Sweden, Denmark, Poland, Turkey, Flanders (Belgium), Piedmont (Italy), Andalusia (Spain).

20 research projects were selected for funding:

<b>SCelecTRA</b>	Scenarios for the Electrification of Transport
<b>FORWARD E2</b>	Forecast, Welfare Analysis and Recommendations on the Diffusion of Electromobility in Europe
<b>EV-STEP</b>	Sustainable Technical and Economic Pathway for Electrified Mobility Systems in EU 27 by 2030
<b>eMap</b>	Electromobility – Scenario based Market Potential Assessment and Policy Options
<b>DEFINE</b>	Development of an Evaluation Framework for the Introduction of Electromobility
<b>SELECT</b>	Suitable Electromobility for Commercial Transport
<b>COMPETT</b>	Competitive Electric Town Transport
<b>E-FACTS</b>	Electric Vehicles for Alternative City Transport Systems
<b>EVERSAFE</b>	Everyday Safety for Electric Vehicles
<b>ABattReLife</b>	Automotive Battery Recycling and 2 <sup>nd</sup> Life
<b>EVREST</b>	Electric Vehicles with Range Extender as a Sustainable Technology
<b>MATLEV</b>	New Materials and Technologies for Lightweight Generic Components of Electric Low Emission Concept
<b>CACTUS</b>	Models and Methods for the Evaluation and the Optimal Application of Battery Charging and Switching Technologies for Electric Busses
<b>Speed for SMEs</b>	Systematic Development of Propulsion Systems for Enhanced Electromobility Drive Trains
<b>WIC2IT</b>	Wireless Inductive Charging to Interoperation Testing
<b>MaLiSu</b>	Nanomaterials for Future generation Lithium Sulphur Batteries
<b>K-VEC</b>	K-Vehicle: Ultra Fast and Distributed Power Charge System for High Performance On-Board eEnergy Storage Devices
<b>FCCF-APU</b>	Fuel Cell Operation on Conventional Fuels as Auxiliary Power Unit for Electric Vehicles
<b>DAME</b>	Development, Validation and Application of an Agent based Modelling Approach of Optimal Integration of Electromobility in Electric Distribution Grids
<b>NEMO</b>	Novel E-Mobility Grid Model



### 3.3.3 CIP-ICT-PSP

The Competitiveness and Innovation Framework Programme (CIP) supports innovation activities of SMEs. It targets the development of the information society by furthering the take-up of ICT. One part of CIP is the Information Communication Technologies Policy Support Programme (ICT-PSP). Within its objective ICT for a low carbon economy and smart mobility it called for pilots in “Smart Connected Electro-mobility”. The pilots should contribute to a pre-deployment and wider uptake of smart connected Electro Mobility and test urban and inter-urban ICT services enhancing the user experience and contributing to the full integration into the transport system. The pilots are required to implement the technology in at least 4 Member States with potential to scale to all member states. The programme supports up to 50 % of the costs of the pilot service implementation and a maximum of 2.5M€ per pilot.

<b>ICT4EVEU</b>	ICT services for Electric Vehicle Enhancing the User Experience <a href="http://www.ict4eveu.eu">www.ict4eveu.eu</a>
<b>MOBI.Europe</b>	Integrated and Interoperable ICT Applications for Electro-Mobility in Europe <a href="http://www.mobieurope.eu">www.mobieurope.eu</a>
<b>MOLECULES</b>	Mobility Based on Electric Connected Vehicles in Urban and Interurban Smart, Clean Environments <a href="http://www.molecules-project.eu">www.molecules-project.eu</a>
<b>SmartCEM</b>	Smart Connected Electro Mobility <a href="http://www.smartcem-project.eu">www.smartcem-project.eu</a>

## 4 European Member States

### 4.1 Austria

#### 4.1.1 Vision, Policies and Legislation

A change to cleaner road traffic by electric mobility is one important measure for Austria to reach the European 2020 goals. Furthermore, electric mobility shall weaken the dependence on oil and strengthen Austria's competitive position by demonstrating Austrian expertise, strengthening its industry by technological innovation and supporting the preservation of jobs. These aims were roadmapped within the topic of energy efficient mobility of the **Austrian Energy Strategy**. This plan recommends the accelerated deployment of electric mobility, and set the aim of 250.000 electric vehicles including plug-in hybrids in 2020 which corresponds to a share of 5% of the overall number of passenger vehicles.

In 2010 the **National Implementation Plan** was launched by the Austrian Ministry for Transport, Innovation and Technology (BMVIT) providing a strategy for the move to electric mobility supplied by renewable energies and imbedded into an intermodal traffic system incorporating public transport. It is intended as a corner stone for national sustainable planning in order to avoid isolated applications, uncoordinated activities, and also prevent negative secondary effects. Within the National Implementation Plan short-distance traffic is identified as the application field with most potential for electric mobility and measures shall be focused on commuters, taxis, public and company fleets, pilot deployment regions and juvenile users of electric two-wheelers. All technologies, battery electric, fuel cell and hybrid electric vehicle shall be targeted, but customized solutions for the different application fields and model regions shall be individually developed. The BMVIT sees its own functions within the National Implementation Plan in managing the process by coordinating, giving impulses, supporting networking and building a platform for coordination and exchange. Furthermore it intends to set the legislative and regulatory conditions, as well as to support and promote relevant projects.

The National Implementation Plan incorporates conclusions from the **Pre-feasibility Study of Market Introduction of Electric Mobility**, a study commissioned by the BMVIT. The diversity of brands and models and the wide establishment of infrastructure were identified within the study as major factors for market penetration. The range limit of batteries, although omnipresent in public discussions and an important factor according to the interview results, was found to be of less relevance within simulations. All these factors can be indirectly influenced by public bodies through promotion of product development, support of education and training, stimulation by establishing electrified public fleets, and by incentives as e.g. facilitation of registration and licensing or tightening of emission standards and recycling regulations, tax reductions or penalties and the like. As for example, consumers have to pay a malus of € 25 for each gram CO<sub>2</sub> emitted in excess of 180g CO<sub>2</sub> / km by their cars.

#### Links and References

Austrian Energy Strategy

<http://www.energiestrategie.at/>

National Implementation Plan, Pre-Feasibility Study

<http://www.bmvit.gv.at/e-mobilitaet>

#### **4.1.2 Funding Organisations and Relevant Platforms**

##### **Federal Ministry of Transport, Innovation and Technology (BMVIT)**

The BMVIT is responsible for transport and infrastructure policies and R&D promotion. The programme relevant for mobility is IV2Splus. Therein, the A3plus programme line incorporates electric mobility.

<http://www.bmvit.gv.at/en/innovation/mobility/index.html>

##### **Federal Ministry for Agriculture and Forestry, Environment and Water Resources and Management (BMLFUW)**

The BMLFUW joins the agricultural and environmental agendas. Electric mobility is funded within the climate protection programme klima:aktiv.

[http://www.lebensministerium.at/umwelt/klimaschutz/klimapolitik\\_national/klima-aktiv.html](http://www.lebensministerium.at/umwelt/klimaschutz/klimapolitik_national/klima-aktiv.html)

##### **Austrian Research Promotion Agency (FFG - Forschungs-Förderungs-Gesellschaft)**

The FFG is a funding institution for applied industrial research. It manages and coordinates funding programmes of public bodies, especially of the BMVIT. It furthermore provides consulting for technology development and innovation.

<http://www.ffg.at/mobilitaet>

##### **KommunalKredit Public Consulting**

The KommunalKredit is a funding and consulting institution specialized on environment, climate and the international carbon market. It manages and coordinates funding programmes for the BMLFUW.

[http://www.public-consulting.at/kpc/de/home/umweltfrderung/fr\\_betriebe/verkehr\\_und\\_mobilitaet/](http://www.public-consulting.at/kpc/de/home/umweltfrderung/fr_betriebe/verkehr_und_mobilitaet/)

##### **Climate and Energy Fund (KLIEN)**

The Climate and Energy Fund was established in 2007 by the BMVIT and the BMLFUW. It received a budget of 450 Million Euro from 2007-2010, and again 147 Million Euro in 2011. Since 2007 it managed 68 programmes and funded 29.000 projects. Its central agenda is a „Zero Emission Austria“ which shall be achieved by new technologies, optimized energy usage and exploitation of renewable energy sources. Electric mobility is fostered within the mobility topic foremost by lighthouse projects and model regions.

<http://www.klimafonds.gv.at/unsere-themen/mobilitaet/>

##### **e-connected**

e-connected is a platform for fast and sustainable deployment of electric mobility. It disseminates news and knowledge about electric mobility via their website. Furthermore, the platform builds a network of relevant stakeholders and organizes expert groups for the topics: education and training, business models, electric vehicles, charging stations, framework requirements, system integrated electric mobility, grid integration and energy storage. The results of these expert groups were published in November 2009 (e-connected I) and December 2010 (e-connected II), and integrated into the National Implementation Plan.

<http://www.e-connected.at/content/publikationen-und-studien>

##### **A3PS - Austrian Agency for Alternative Propulsion Systems**

A3PS is a coordination platform with partners from universities, R&D institutions and industry. It aims to stimulate the cooperation of complimentary partners, interdisciplinary research and demonstration projects, and international networking. The platform compiles and analyzes information and recent developments regarding alternative propulsion systems and provides this knowledge base to its partners through studies, lectures, workshops and conferences. A3PS also advertises the Austrian technology and engineering knowhow to the international public and represents Austria in international panels and initiatives of the EU and the IEA, where it is operating a working group of the Implementing Agreement Hybrid and Electric Vehicles which is dealing with electric vehicle system integration. On a national level it develops roadmaps and visions to support the communication between politics,

industry and scientific community, and counsels public bodies regarding the efficient design of public funding instruments.

<http://www.a3ps.at/site/en>

#### **AMP – Australian Mobile Power**

Austrian Mobile Power integrates key Austrian companies from the energy sector, research institutions and industry. Together they invest 50 Million Euro into the provision of a complete system for electric mobility in order to put 210,000 electric vehicles on Austrian roads until 2020.

<http://www.austrian-mobile-power.at/>

### **4.1.3 Funding Programmes**

#### **Intelligent Transport Systems and Services (IV2Splus)**

The major mobility funding programme IV2S was launched by the BMVIT in 2002 and was succeeded in 2007 by the IV2Splus programme. The programme, conducted by the FFG, is a framework strategy programme incorporating different core areas: A3plus (Alternative Propulsion Systems and Fuels), I2V (Intermodality and Interoperability of Transport Systems), ways2go (Technologies for Evolving Mobility Needs) and Impuls covering basic research for innovations in transport. Furthermore the European programmes of the European Research Area Network (ERA-NET Transport and specifically Electromobility+) are included.

<http://www.ffg.at/iv2splus>

#### **Alternative Propulsion Systems and Fuels (A3plus)**

The A3plus programme concentrates on alternative propulsion systems and alternative fuels for road, rail and inland waterway traffic. It funds R&D for highly efficient drive trains, innovative concepts for energy storage for alternative fuels and vehicle electronics for energy efficient control. In parallel alternative fuels and solutions for the respective infrastructure are supported. The programme aims for cooperative research consortia from industry, university and non-university research institutions, but also other relevant stakeholders from the R&D cycle. Three calls were launched in 2007 and 2008 for which 57 proposals were received and 49 were accepted for funding. These included three lighthouse projects. The total funding volume was 14 Million Euro. The call in 2009 with a funding volume of 15 Million Euro received 32 proposals from which 15 funded projects resulted. The fourth call launched in 2010 again provides a funding volume of 5 Million Euro.

<http://www.ffg.at/alternative-antriebssysteme-und-treibstoffe>

#### **New Energies 2020**

Within the New Energies 2020 programme the Climate and Energy Fund financially supports foremost lighthouse projects, model regions and projects for smart grids. The programme called relevant stakeholders to propose cooperative research projects within the years 2008-2010. One call in 2008 focused on energy storage and conversion technologies. The third call in 2010 dedicated 35 Million to energy systems regarding grids and users, storage technologies and energy efficient vehicle components and systems.

<http://www.ffg.at/neue-energien-2020-das-programm>

#### **Model Regions for Electric Mobility**

Together with the BMLFUW the Climate and Energy Fund supports demonstration projects by fostering the development of charging infrastructure, provision of renewable energy, the testing of business models and the increasing of public awareness. Since 2008 this programme selected 8 model regions: VLOTTE in Rheintal (budget 5.2 million Euros), ElectroDrive Salzburg (budget 1.9 million Euros), e-mobility on demand in Vienna (budget 1.3 million Euros), e-mobility in Graz (budget 1.6 million Euros), e-mobilized Eisenstadt (budget 560.000 Euros), e-pendler in Niederösterreich (budget 1.3 million Euros), E-LOG in Klagenfurt (budget 1.6 million Euros), and E-Mobility Post in

Wien (budget 3.3 million Euros). The final call in 2011 dedicated a budget of 2.5 Million Euro primarily to commuters and logistics.

<http://www.e-connected.at/content/modellregionen-0>

<http://www.klimafonds.gv.at/foerderungen/aktuelle-foerderungen/2011/modellregionen-der-e-mobilitaet/>

### **Technological Lighthouses of Electric Mobility**

Another measure of promotion of electric mobility of the Climate and Energy Fund is the programme for lighthouse projects launched in 2009 with a budget of 11 Million Euro. Funded are technology innovations made in Austria that are close to market introduction in the topics energy storage, electronic control systems, charging systems and grid integration, as well as user behavior. In 2009 the projects emporA and Clean Motion Oberösterreich (CMO) were funded. The second call in 2010 with a budget of 9.2 Million Euro supported the project emporA2-E-Mobile Power Austria from the Austrian Mobile Power with 2.2 Million Euro, the project CMO-Clean Motion Offensive with 4.4 Million Euro and eMORAIL – Integrated eMobility Service for public Transport with 2.6 Million Euro. The third call in 2011 with a budget of 6 Million Euro was open until the summer 2011.

<http://www.klimafonds.gv.at/foerderungen/aktuelle-foerderungen/2011/leuchttuerme-der-elektromobilitaet/>

<http://www.klimafonds.gv.at/assets/Uploads/Downloads-Frderungen/E-Mobilitaet/Leuchttme-Elektromobilitt/techltemobility2011RZenglisch.pdf>

### **klima:aktiv mobil**

This programme, funded by the BMLFUW together with the Austrian Energy Agency, generally aims to reduce CO<sub>2</sub> and other climate and health relevant emissions in traffic. One measure is the promotion of electric mobility in companies and communities. Special programmes foster the purchase of charging stations, electric bikes as well as the conversion of fleets to electric vehicles. In 2011 the programme had a budget of 12.5 Million Euro.

<http://www.klimaaktiv.at/article/archive/18571/>

## **4.2 Belgium**

### **4.2.1 Vision, Policies and Legislation**

The Belgian state consists of the federal government, three regions (Flemish, Walloon, Brussels-Capital), and three communities (Flemish, French, German). The environmental policies are agreed upon between the federal and regional governments and include among others the compliance to the Europe 2020 goals, a reduction of fine particles until 2020 by 25% with respect to 2007, a maximum of 25 days per year with an 8 hour average of 120 µg/m<sup>3</sup> ozone, and a 50% decrease of the part of population seriously affected by traffic noise. To reach these aims electric mobility is promoted at federal and regional levels. The regions have the main responsibility for the funding of strategic and applied R&D and innovation which they execute with thematically and technologically rather unspecific programmes. A strong focus lies on tax incentives, seed funding, venture capital and the like. The company car tax and additional legal advantages for company car users is based on CO<sub>2</sub> emission with special reductions for electric vehicles. There are also tax incentives for private car holders based on CO<sub>2</sub> emissions and extra incentives for pure electric vehicles. For objective information on the environmental friendliness of a specific car, the **Ecoscore** has been developed by VITO, the Vrije Universiteit Brussel and other partners. Within a well-to-wheel analysis, the ecoscore accounts 50% of the final score to climate change, 20% to health effects, 20% to impact on ecosystem and 10% to noise. It is being evaluated how the ecoscore can be used to define incentives more efficiently for the development of sustainable transport.

Currently, an incentive for the purchase of electric vehicles is a rebate of 15% of the purchase price (up to a maximum of 4,540 Euros). Further a bonus-malus system has been installed in the Walloon region where consumers can get or have to pay up to 1,000 Euros.

## Links and References

Ecoscore

<http://www.ecoscore.be/>

### 4.2.2 Funding Organisations and Relevant Platforms

Due to the strong regional character of the funding infrastructure, the organisations listed in the following are grouped into federal organisations, and organisations from Brussels area, Flanders and Walloon region.

#### Federal Organizations

##### **Belgian Federal Science Policy Office (BELSPO)**

The Office implements the research responsibilities of the Federal State, supports ten federal scientific institutes and coordinates large “inter-university attraction poles”. There exist no automotive or electric mobility specific programmes.

[http://www.belspo.be/belspo/home/port\\_en.stm](http://www.belspo.be/belspo/home/port_en.stm)

##### **Interministerial Commission for Science Policy (ICSP)**

The objective of the ICSP is to coordinate the preparation and implementation of governmental decisions with regard to federal scientific policy which require the concerted action of two or several ministerial departments. The Commission comprises officials from the federal departments.

[http://www.belspo.be/belspo/coordination/scienPol\\_ICSP\\_en.stm](http://www.belspo.be/belspo/coordination/scienPol_ICSP_en.stm)

##### **ASBE**

ASBE is the Belgian section of the European AVERE network for manufacturers, suppliers, importers and distributors of electrically propelled vehicles and accessories. The purpose of the association is to promote the use of battery-electric, hybrid and fuel cell electric vehicles and supporting scientific and technological developments.

<http://www.asbe.be/en/>

##### **FEDERAUTO Electric Mobility Group**

FEDERAUTO is the confederation of industry from motor trade and repair and related sectors. The electric mobility group intends to unite the companies of the electric vehicle sector, and to lobby at the various levels of federal, regional and local government in order to support the development of infrastructure, the funding of pilot projects and a custom eco-tax for the vehicle users. Furthermore, the group focuses on education and training as well as regulation and standardization.

<http://www.federauto.be/Federauto/NL/Home/page.aspx/992>

#### Brussels-Capital Region

##### **Innoviris - Brussels Institute for Research and Innovation**

Innoviris was formerly known as Institute for the encouragement of Scientific Research and Innovation of Brussels (IRSIB). Innoviris' mission is the promotion and support of technological innovation by funding R&D projects conducted by companies and research organizations located in Brussels area. The research areas include ICT, clean technologies, energy efficiency and sustainable development in general. For the development of regional economies the programme "Spin-Off in Brussels" was launched in 2006. This programme aims to transfer the results of scientific research into practical applications for the creation of new enterprises (spin-offs) in the Brussels-Capital. Given the success of this programme, a new call for projects was launched in 2011.

<http://www.irsib.irisnet.be/>

## **Flanders Region**

### **Agency for Innovation by Science and Technology (IWT)**

The IWT is a governmental agency helping Flemish companies and research centres to realize R&D projects. IWT offers financial funding, advice and access to a network of potential partners in the Flanders region and abroad. Furthermore, the agency supports and advises the Flemish Government regarding its innovation policy.

<http://www.iwt.be/english/welcome>

### **VITO (Flemish Institute for Technological Research)**

VITO is an independent European research and consulting centre for sustainable technologies in energy, environment, materials and remote sensing. The topics relevant for electric mobility are studies of hybrids and pure electric vehicles with focus on energy storage systems as well as the smart grid. VITO provides policy-relevant information and support to Regional, National and European governments.

<http://www.vito.be/VITO/EN/HomepageAdmin/Home/home/>

### **Flander's Drive**

Flander's Drive is a competence centre with the specific mission to support the Flemish automotive industry. In 2008, this competence centre received 18.8 million Euros for the period 2008-2011. These governmental funds are managed by IWT, being also an observer on the board. Within their **Clean Powertrains domain**, Flander's Drive has three projects directly related to electric mobility studying energy storage, inductive charging and the development of a complete electric powertrain.

<http://www.flandersdrive.be/clean-powertrains>

## **Walloon Region**

### **Cluster AutoMobilité de Wallonie (CAW)**

CAW is one of 14 clusters in Wallonie. It brings together automotive actors, research centres and universities to build an independent interdisciplinary network of 170 partners. The objectives are to collect and analyse all relevant information concerning research, export, finance and entrepreneurship in the sector, to increase the interaction between economic operators, the private and public agencies, and to encourage collaborations, create new activities, new products and represent the sector abroad.

<http://clusters.wallonie.be/federateur/fr/index.html>

### **Service Public de Wallonie - Direction générale opérationnelle Mobilité et Voies hydrauliques Direction de la Planification de la Mobilité**

The mobility department of the Walloon Region government supports communities in acquisition of electric vehicles. Since October 2010 approximately 80 communities received a total of 1.8 Million Euro subsidies.

[http://mobilite.wallonie.be/opencms/opencms/fr/mobilite\\_conviviale/Vehicules\\_electriques/](http://mobilite.wallonie.be/opencms/opencms/fr/mobilite_conviviale/Vehicules_electriques/)

### **Green Propulsion**

Green Propulsion is an independent R&D centre with practical experience in alternative fuels, battery electrics, hybrids, fuel cells. Based on its expertise, Green Propulsion provides consultancy to promote clean vehicle technologies.

<http://www.greenpropulsion.be/en/>

## **4.2.3 Funding Programmes**

Currently, there is no specific information available.

## 4.3 Czech Republic

### 4.3.1 Vision, Policies and Legislation

As in most European countries, support of electric mobility arises from the wish to reduce emissions, especially CO<sub>2</sub>, and from the need to be independent from oil. Since the Czech Republic is the third largest net-electricity energy exporter in Europe, electric mobility may seem to be an even more appealing solution to emission, noise and fuel problems. Although complying with the goals set by the Kyoto protocol, the Czech Republic has per capita higher emissions than the European and global average. Especially cutting emissions by increasing energy efficiency has still great unused potential in the Czech Republic. In 2009 an updated draft of the **State Energy Concept** was released that focuses mainly on economic independence and maximum use of home resources, but also on climate related policies. The transport sector has been identified as a priority sector for heightening energy efficiency and cutting emissions. Main objectives are expanding public transport and diversifying the fuel mix by moving to alternative fuels. However, there is also a programme for electric mobility proposed including different instruments. The major player regarding electric mobility projects is the Czech Energy Company (CEZ). It is engaged in pilot deployment projects with European partners and also invests in R&D. These projects include European partners. According to CEZ 3% or about 130.000 vehicles of all cars in the Czech Republic could be electric by 2020 meaning pure electric and plug-in hybrids. Other analysts estimate even a 10% share. The investment and business development agency of the Czech Republic, CzechInvest, is engaged in the promotion of electric mobility. Currently, there is a working group composed of representatives from various ministries to discuss the implementation of financial supports for renewable energy and ecological modes of transport.

#### Links and References

State Energy Policy of the Czech Republic

<http://download.mpo.cz/get/26650/32422/345285/priloha001.doc> (English, 2004)

<http://www.mpo.cz/kalendar/download/71707/priloha002.pdf> (Czech, 2009)

Transportation Policy of the Czech Republic for 2005 – 2013

<http://www.mdcr.cz/NR/rdonlyres/.../DPanglickaverzeFINAL.pdf>

State Environmental Policy of the Czech Republic (2008)

[http://www.mzp.cz/C125750E003B698B/en/sep\\_cz/\\$FILE/OPZP-SEP-20081229.pdf](http://www.mzp.cz/C125750E003B698B/en/sep_cz/$FILE/OPZP-SEP-20081229.pdf)

Strategic Framework for sustainable development in the Czech Republic (2010)

[http://www.mzp.cz/.../en/czech\\_republic\\_strategy\\_sd/.../KM-SFSD\\_CR\\_EN-20100317.pdf](http://www.mzp.cz/.../en/czech_republic_strategy_sd/.../KM-SFSD_CR_EN-20100317.pdf)

Energy Policies of IEA Countries - Czech Republic

<http://www.iea.org/textbase/nppdf/free/2010/CzechRepublic2010.pdf>

Green Mobility

<http://www.czechinvest.org/data/files/green-mobility-brochure-2807-en.pdf>

Press Release (2011), ČEZ

<http://www.cez.cz/en/cez-group/media/macroeconomic-news/991.html>



#### 4.3.2 Funding Organizations and Relevant Platforms

##### **Transport Research Centre (CDV) - Division of transport infrastructure and the environment**

The CDV was established in 1992 as a successor to the Czech Transport Departments Research Institute. The basic purposes of the centre are research and development activities, processing expertise, ensure projects and services for Ministry of Transport, as well as providing expert opinions for authorities, both public and commercial entities.

<http://www.cdv.cz/en/division-2/>

##### **OSE - Občanské sdružení Elektromobily**

OSE is the Czech member organization of AVERE. The association aims at promoting electric vehicle use powered by renewable sources. Other goals include supporting the building of a network of charging stations and promoting needed legislation.

<http://www.elektromobily-os.cz/>

##### **Czech Energy Company (CEZ)**

The Czech Energy Company is a utility that actively promotes the implementation of electric mobility by pilot projects and investments in infrastructures like charging stations.

<http://www.cez.cz/en/home.html>

##### **State Environmental Fund of the Czech Republic (SEF)**

SEF is one of the essential economic instruments used to fulfill the obligations arising from the international conventions on environmental protection and serves also as an instrument to implement the State Environmental Policy.

<http://en.sfzp.cz/sekce/585/sef/>

#### 4.3.3 Funding Programmes

Currently, there is no specific information available.

### 4.4 Denmark

#### 4.4.1 Vision, Policies and Legislation

In 2011 a new **Danish Energy Strategy “Our Future Energy”** was released aiming towards a higher share of renewable energies which shall deliver independence from fossil fuels and a reduction in CO<sub>2</sub> emissions. Lately, also a new **Danish Energy Agreement** was published by the Ministry of Climate, Energy and Building. The Agreement contains a wide range of ambitious initiatives, bringing Denmark a good step closer to the target of 100% renewable energy in the energy and transport sectors by 2050. According to these publications, Denmark plans to achieve four major goals: (i) more than 35% renewable energy in final energy consumption, (ii) approximately 50% of electricity consumption to be supplied by wind power, (iii) 7.6% reduction in gross energy consumption in relation to 2010, and (iv) about 35% reduction in greenhouse gas emissions in relation to 1990. These goals are related to the **Danish Energy Strategy 2050** which sets the objective of being independent from oil in 2050. The increasing amount of wind power requires a move to more flexible energy usage and storage. Bidirectional charging of the car battery can be exploited as flexible energy storage. Hence, electric mobility is for Denmark not only a means to cut emissions, raise energy efficiency in transport and reduce noise, but also to facilitate the employment of renewable energy sources. Important factors for the success of electric mobility in Denmark may be that 85% of Danish population lives in urban areas and that every Dane on average travels a distance less than 50 km daily. A preceding **Danish Energy Agreement** was passed in 2008 that dedicated 4 million Euros for promotion and demonstration of battery electric vehicles.

Further incentives are given by tax reductions based on CO<sub>2</sub>. The annual circulation tax is based on fuel consumption. Electric vehicles weighing less than 2,000 kg are exempt from the registration tax and VAT.

## **Links and References**

Danish Energy Strategy "Our future energy"

[http://www.ens.dk/Documents/Netboghandel%20-%20publikationer/2011/our\\_future\\_energy\\_%20web.pdf](http://www.ens.dk/Documents/Netboghandel%20-%20publikationer/2011/our_future_energy_%20web.pdf)

Danish Energy Agreement for 2012 to 2020

<http://www.ens.dk/da-DK/Politik/Dansk-klima-og-energi-politik/politiskeaftaler/Documents/Accelerating%20green%20energy%20towards%202020.pdf>

Danish Energy Strategy 2050

<http://www.kemin.dk/Documents/Klima-%20og%20Energi/Politik/Energy%20Strategy%202050%20web.pdf>

Danish Energy Agreement for 2008 to 2011

[http://www.ens.dk/en-US/policy/danish-climate-and-energy-policy/Documents/Energy%20Policy%20Agreement%2021%20Feb%2008\\_final.pdf](http://www.ens.dk/en-US/policy/danish-climate-and-energy-policy/Documents/Energy%20Policy%20Agreement%2021%20Feb%2008_final.pdf)

Green Transport Vision

<http://www.trm.dk/graphics/Synkron-Library/trafikministeriet/Engelsk%20site/Green%20transport.pdf>

A Greener Transport System in Denmark

<http://www.trm.dk/~media/Files/Publication/English/EUPrecidency%202012/A%20greener%20transport%20system-netversion.ashx>

### **4.4.2 Funding Organisations and Relevant Platforms**

#### **Ministry of Climate and Energy**

The Danish Ministry of Climate and Energy was established in 2007 as a part of Danish efforts to move towards a greener and more sustainable society, as well as to be independent from oil.

<http://www.kemin.dk/en-US/Sider/frontpage.aspx>

#### **Danish Energy Agency**

Established in 1976 the Danish Energy Agency works under the Ministry of Climate and Energy. The agency is responsible for all matters regarding energy production, transportation and usage. It explicitly is required to consider the impact on climate, and engage in the cut of greenhouse gas emissions.

<http://www.ens.dk/en-US/Sider/forside.aspx>

#### **Energynet.dk**

Energynet.dk is an independent public enterprise owned by the Danish state as represented by the Ministry of Climate and Energy. Energynet.dk owns the energy infrastructure and is responsible for the security of energy supply in Denmark. It ensures fair competition and promotes green energy solutions aiming to create an energy system based on renewable sources with focus on wind energy. In this regard R&D and deployment of electric vehicles and especially their connection into the grid are fostered, in order to exploit them as flexible energy storage. It offers financial support for the

development of green energy technologies through the ForskEL and ForskVE-programmes. Energinet.dk believes there will be 100,000 electric cars in Denmark in 2013.

<http://energinet.dk/EN/Sider/default.aspx>

#### **Danish Agency for Science, Technology and Innovation (DSF)**

The DSF manages research activities and funding for innovation for the Danish Council for Independent Research, the Danish Council for Strategic Research, the Danish Council for Technology and Innovation and the Danish Research Training Committee under patronage of the Danish Research Coordination Committee. Among the established programme committees one is dealing with sustainable energy and environment. Research Topics in 2009 and 2010 were future energy systems, competitive, environmental technology and the future climate.

<http://en.fi.dk/>

#### **Centre for Green Transport**

The Centre of Green Transport was established under Denmark's Road Safety and Transport Agency as part of the agreement "A Green Transport Policy" of 2009. A budget of 284 Million DKK for the period of 2009-2013 is dedicated to implementation of initiatives. By creating synergies between initiatives and disseminating knowledge and results of projects, the centre builds the framework for a centre of excellence regarding sustainable transport. The Centre for Green Transport focuses on alternative forms of transport that reduce CO<sub>2</sub> emissions. It conducts test and demonstration projects for energy efficient transport and aims to network and share knowledge with players developing energy efficient vehicle technologies. Further activities are a programme for green certification of transport modes and vehicles and an energy-efficient driving campaign.

<http://www.centerforgrontransport.dk/EN.aspx>

#### **Danish Electric Vehicle Alliance**

The Danish Electric Vehicle Alliance is an independent trade association under the Danish Energy Association. Its purpose is to build synergies between the energy and automotive sector and thus act as major player in the promotion and introduction of electric vehicles in Denmark.

<http://www.danskelbilalliance.dk/English.aspx>

### **4.4.3 Funding Programmes**

Denmark has no automobile industry, but many component suppliers. Hence, national R&D programmes mainly focus on biofuels, smart grid and fuel cells. Relevant for fully electric vehicles are projects for smart grid control and integration as well as for electric vehicle batteries.

#### **Energy Technology Development and Demonstration Programme (EUDP)**

The EUDP was established in 2007 and is headed by an independent board appointed by the Minister for Climate and Energy. The programme supports the development and demonstration of new energy technologies that help to reduce the dependence on fossil energy, minimizes CO<sub>2</sub> emissions and reduces the environmental impact of energy consumption. Developed technologies should lead to products designed for market implementation. Funding is available for private and public commercial enterprises and knowledge institutions or consortia thereof. The programme is managed by the Danish Energy Agency.

[http://www.ens.dk/en-US/policy/Energy\\_technology/Danish\\_Funding\\_Programmes/Sider/Forside.aspx](http://www.ens.dk/en-US/policy/Energy_technology/Danish_Funding_Programmes/Sider/Forside.aspx)

#### **ForskEL - The Danish Transmission System Operator Energinet.dk**

The programme releases calls each year with a budget of 130 million DKK for funding of R&D in environmentally-friendly electricity generation technologies and a reliable energy transmission system. Smart grid control and also ICT for smart grid connection as well as energy storage in general

and specifically for transport applications are regularly included as funded topics with varying emphasis. One example of funded projects is E.D.I.S.O.N. ("Electric vehicles in a Distributed and Integrated market using Sustainable energy and Open Networks") with a total budget of approximately 49 million DKK of which 33 million DKK are contributed by FORSKEL. EDISON aims to develop optimal system solutions for EV system integration, including network issues, market solutions, and optimal interaction between different energy technologies.

<http://energinet.dk/EN/FORSKNING/ForskEL-programmet/Sider/default.aspx>

### **Test scheme for electric vehicles**

This subsidy scheme managed by the Danish Energy Agency, has a dedicated budget of 10 million Euros per year in 2008 and 2009 and 5 million DKK per year in 2010-2012. The objective is to gain practical experience with electric cars and the required infrastructure, and to illustrate advantages of and barriers for the mass deployment of electric vehicles. Furthermore, opportunities for integrating electric cars as a flexible storage facility into the Danish electricity system shall be evaluated. The initiative comprises practical tests, assessment and analysis. Within practical tests the funding is intended to support fleet owners in acquiring electric cars and charging stations as well as costs for monitoring, documentation etc. In the first round, 17 projects have been granted subsidies for a total of 44 electric cars, vans, minibuses and lorries. The funds went to two regional authorities, six municipalities, five private enterprises, two organisations/associations and one knowledge institution (two projects).

<http://www.ens.dk/EN-US/CLIMATEANDCO2/TRANSPORT2/Sider/testscheme.aspx>

### **The Danish EV promotion programme**

In February 2008, almost all political parties in the Danish Parliament entered into a new Climate and Energy Agreement. As part of this agreement, the parties agreed to allocate 4 million euros to promote demonstration programs for battery EVs, beginning in December 2008. The purpose of the EV promotion program is to obtain data about users' experiences with EVs. Monitoring experiences will help identify practical barriers for the deployment of EVs in Denmark. The program is being administered by the Danish Energy Agency. In spring 2009 support was granted totalling 1.3 million euros for 17 projects for 49 EVs, which included cars, vans, minibuses and trucks. In early 2010 about 940,000 euros was allocated, resulting in grants for 45 additional cars. In February 2011, 1.5 million euros were allocated. The remaining 670,000 euros were scheduled for allocating in the beginning of 2012.

### **Test an EV**

During 2010, ChoosEV planned and initiated an EV test and demonstration program called TestEnElbil (Test an EV), which may be the largest such program in Europe. In cooperation with 30 local authorities, 300 EVs during a period of 2 years will be put at the disposal of 2,400 families for a period of 3 months each. During the project period user experiences and data based on a total mileage of about 6 million kilometres and about 300,000 battery charges will be collected for research and analysis. The project started in October 2010 and will run until 2013.

<http://testenelbil.clever.dk/english/>

## **4.5 Finland**

### **4.5.1 Vision, Policies and Legislation**

Transport makes up 20% of Finnish greenhouse gas emissions according to the Finnish Ministry of Transport and Communications. To comply with European policies and legislations, in March 2009 the **Climate Change Policy (ILPO)** was prepared aiming to cut the greenhouse gas emissions caused from transport by 2.8 million tonnes. One supporting measure is a renewal of the private car fleet

which shall be reached by tax incentives and research and promotion of different technical and fuel alternatives. A tax based on CO<sub>2</sub> emissions has been introduced gradually since 2010. The target is an annual renewal of car stock by 7% and new sold cars in 2020 being close to the EU targets (95 g/km). Further measures taken to cut emissions are: improving transport energy efficiency, directing the growth in personal transport in urban areas towards forms of transport that place less burden on the environment, utilising the information society and communications policy to achieve Finland's climate targets. The advancement will be monitored, and in 2012 a decision on additional financial instruments will be made.

Special incentives or programmes for HEV and FEV do not exist. However, in 2010 a **task force memorandum** was released underlining the growing importance and potential of electric mobility, especially for the Finnish economy. This memorandum gave the target of 25% of new sold cars in 2020 being chargeable from the grid, 40% of those being full electric. Especially, since driving distances in Finland tend to be long, hybrids are expected to be deployed rather than full electric vehicles.

A report mandated by the Ministry of Transport submitted by February 2011 analysed that until 2030 electric mobility will not significantly contribute to the reduction of greenhouse gas emissions in Finland. It is, however, already now considered of importance to construct a public charging infrastructure and launch demonstration projects as well as to conduct research and education in the electric vehicle sector.

## Links and References

Transport Revolution - international perspectives

[http://www.lvm.fi/c/document\\_library/get\\_file?folderId=1551284&name=DLFE-12249.pdf&title=Julkaisu%2028-2011](http://www.lvm.fi/c/document_library/get_file?folderId=1551284&name=DLFE-12249.pdf&title=Julkaisu%2028-2011)

The Future of Electric Cars in Finland (Finnish)

[http://www.lvm.fi/c/document\\_library/get\\_file?folderId=1551284&name=DLFE-11701.pdf&title=Julkaisu%2012-2011](http://www.lvm.fi/c/document_library/get_file?folderId=1551284&name=DLFE-11701.pdf&title=Julkaisu%2012-2011)

Finnish Ministry of Transport and Communications

<http://www.lvm.fi/web/en/22>

### 4.5.2 Funding Organisations and Relevant Platforms

#### **Finnish Funding Agency for Technology and Innovation (TEKES)**

Tekes is the most important publicly funded expert organisation for financing research, development and innovation in Finland. In 2011 it announced the launch of the electric vehicle programme EVE.

<http://www.tekes.fi/en>

### 4.5.3 Funding Programmes

In 2009 TEKES spent approximately 4 million Euros on electric vehicle related projects. In 2010 it were 5.4 million Euros of which 4 million went to research institutes and universities and the rest to industry. Funded topics were: battery chemistry, material research, electric power trains and hybridization.

#### **Electric Vehicle Systems Programme (EVE)**

In 2011 Finland has launched its largest ever project for the promotion of electric vehicles and charging systems, with the objective of creating a unified testing environment for more than 400 vehicles and 850 charging points over the next four years. The Electric Vehicle Systems Programme

aims at companies and research institutes that work with electric vehicles and according machinery, components and systems. This programme has a budget of 80 million Euros assigned until 2015. Approximately half of it will be managed by TEKES and the rest will be covered by private funding. EVE works towards increasing the business related to electric vehicles from 200 million Euros in 2010 to 2 billion Euros in 2020 by creating a community of relevant stakeholders with close relations to international research and business networks. Another cornerstone of the programme is the development of testing environments and standards.

<http://www.tekes.fi/programmes/EVE>

## 4.6 France

### 4.6.1 Vision, Policies and Legislation

France is the second largest car manufacturer in Europe. Its automotive sector is of considerable economic importance since it represents close to 10% of the jobs in the manufacturing and energy industries and makes up for more than 12% of French exports. Thus, the promotion of electric mobility is not only important for reaching France's goals on climate protection, but to considerably support a leading industry sector.

In 2007, the **Grenelle de l'Environnement**, a summit of state and civil society for sustainable development, identified strategies to counter climate change and to set environmental goals to be targeted by national sustainability programmes. In this context, vehicle electrification was declared as being part of sustainability.

A € 400 million funding for R&D and demonstration projects on low carbon vehicles (vehicle development, charging infrastructure) over 2008-2012 has been established, thereof € 90 million for the research on EV technology.

In 2009, the French Minister for Energy declared the goal of having 2 million electric cars on French roads and installing 4.4 million charging stations by 2020. For reaching those aims supporting measures for the industry to get out of the automotive crisis have been set up that favor electric mobility. Furthermore, the **Plan Véhicule Décarboné** has been implemented in 2009 for the deployment of electric mobility in France detailing the following 14 actions:

1. The French Environment and Energy Management Agency (ADEME) will launch a call for projects on infrastructure costs to support plug-in demonstrators and trials and to validate an ecosystem of rechargeable vehicles. For this stage of the plan, which will begin in early 2010, 70 million Euros have been dedicated.
2. ADEME will develop a roadmap containing mobility solutions looking at developments in transportation based on new technology and service. A following new call has a dedicated budget of 25 million Euros.
3. Renault will establish a lithium-ion battery factory in Flins in partnership with CEA. The goal is to produce 100,000 batteries annually. The investment will be 625 million Euros of which 125 million Euros will be contributed by the public.
4. A group of companies, including La Poste, EPA, Air France, EDF Energy, France Telecom and more, will commit to buying electric vehicles with a range of at least 150 km. The goal of 100,000 vehicles by 2015 is set.
5. A grant of 5,000 Euro for buying vehicles with CO<sub>2</sub> emissions less than or equal to 60 g/km will be established until 2012. Hybrids, LPG or natural gas vehicles with emissions less than or equal to 135 g/km may also benefit from a 2,000 Euro bonus. Establishment of standard outlets to charge cars outside homes.
6. Standard outlet for charging electric vehicles outside of homes shall be available.
7. By 2012, the construction of office or home buildings shall compulsory require the installation of charging systems by 2012.
8. The installation of charging systems in condominiums shall be supported.
9. Parking for office buildings shall compulsory provide charging stations until the year 2015.

10. An agreement on common European charging standards shall be made.
11. Municipalities will be supported in deploying public charging infrastructure.
12. 1.5 billion Euros will be dedicated to fostering the deployment of a public infrastructure network.
13. The use of renewable electricity for recharging vehicles shall be maximized.
14. Ways for recycling or reuse of batteries shall be researched.

Furthermore, in 2009 a bonus-malus system based on CO<sub>2</sub> emissions has been replaced by tax incentives. The “**Prime à la Casse**” programme, which reimburses car buyers when replacing an old car by one emitting below 160 g/km of CO<sub>2</sub>, was extended for two years. These incentives promote low emission vehicles but not necessarily electric vehicles. Additionally, in order to overcome the automotive crisis, a 7.5 billion Euros loan has been given to French automakers Renault and Peugeot for producing low emission vehicles.

Also in 2009, a dedicated **roadmap for low-carbon vehicles** has been published by the French Environment and Energy Management Agency, powertrain electrification being a major topic.

In February 2009, the government launched the **National Strategy for the Deployment of Electric and Hybrid Vehicle Charging Infrastructure** and installed a special working group responsible for the coordination and installation of a standardised national charging network for PHEVs and battery powered EVs. The French government announced the plan to have two million FEVs on the road in 2020.

#### **Links and References**

Ministry for Ecology, Sustainable Development and Spatial Planning – Sustainable Mobility (French)  
<http://www.developpement-durable.gouv.fr/-Vehicules-.html>

Grenelle de l'Environnement  
<http://www.legrenelle-environnement.fr/-Version-anglaise-.html?rubrique33>

Plan Véhicule Décarboné (French)  
[http://www.developpement-durable.gouv.fr/IMG/pdf/dossier\\_de\\_presse\\_vehicules\\_ecologiques.pdf](http://www.developpement-durable.gouv.fr/IMG/pdf/dossier_de_presse_vehicules_ecologiques.pdf)

Prime à la Casse Programme (French)  
<http://www.developpement-durable.gouv.fr/IMG/pdf/LPS52.pdf>

Roadmap for Low-Carbon Vehicles  
<http://www2.ademe.fr/servlet/getBin?name=BF646D8ECA45584024075E587B2D29271247754335560.pdf>

National Strategy for the Deployment of Electric and Hybrid Vehicle Charging Infrastructure  
[http://www.ceati.com/IEA\\_PHEV/files/Electric%20Car%20Infrastructure\\_France.pdf](http://www.ceati.com/IEA_PHEV/files/Electric%20Car%20Infrastructure_France.pdf)

#### **4.6.2 Funding Organisations and Relevant Platforms**

##### **Ministry for Ecology, Sustainable Development and Spatial Planning (MEDAD)**

The MEDAD finances the 5,000 Euro subsidy to each private buyer of a new electric car, sets legal standards and formulates technical recommendations for EV infrastructures. Moreover, it funds R&D for the electric vehicle through the Agency for Environment and Energy Management (ADEME).

<http://www.developpement-durable.gouv.fr/>

### **French Environment and Energy Management Agency (ADEME)**

The public agency works under the joint supervision of MEDAD and the Ministry for Higher education and Research. It focuses on the environment and energy management, implementing public policies, providing expertise and advisory services to companies, local authorities, government bodies and the public at large. Its Transport and Mobility Department implements funding of R&D projects regarding electric vehicles via the Programme of Research, Experimentation and Innovation in Land Transport (PREDIT).

<http://www2.ademe.fr/servlet/getDoc?id=38480&m=3&cid=96>

### **Pôle de Compétitivité: Mov'eo**

The cluster Mov'eo was set up in 2006 and currently has 292 members including 75 large corporations as e.g. PSA & Renault, 134 SMEs and 38 research centres. Mov'eo focuses on seven research topics, many of which are related to electric mobility: mobility solutions, road safety, demonstration of low CO<sub>2</sub> vehicles, the environmental impact of vehicles, energy storage systems, mechatronic systems, and ICE powertrains. Within Mov'eo 203 R&D projects were launched with an investment value of 660 million Euros. 91 of these projects received public funding of 260 million Euros total. Mov'eo also aims at European and international collaboration. Out of an initiative of the Mov'eo competition cluster and Versailles Saint-Quentin-en-Yvelines University (VSQU) on 13 May 2010, the Mov'eoTec Foundation was created with ten founding members: VSQU, ESIGELEC, IFSTTAR, IFPEN, and the CETIM. The Mov'eoTec foundation works for public interest, and aims to support training and scientific research into sustainable solutions for transportation that is friendly to both mankind and the planet. Designed to contribute to the creation and development of research labs, scientific and technical platforms, the design of high level international training programmes, and the implementation of industrial chairs, the Foundation was chosen to lead the Vedecom project, whose name it will soon also bear.

<http://www.pole-moveo.org/EN/index.php>

<http://www.fondation-moveotec.com/>

[http://www.fondation-moveotec.com/images/stories/Communique\\_Presse\\_-\\_IEED\\_VeDeCoM\\_laureat\\_du\\_Programme\\_Investissements\\_Avenir.doc](http://www.fondation-moveotec.com/images/stories/Communique_Presse_-_IEED_VeDeCoM_laureat_du_Programme_Investissements_Avenir.doc)

### **Pôle de Compétitivité: Véhicule du Futur**

The cluster was established in 2005 and now has 200 members. Among them are 60 large corporations, 110 SMEs and 18 R&D centres and universities. The cluster focuses on smart driving systems, urban mobility solutions, urban vehicles, durable technologies for terrestrial transportation and non-technological and training projects. Within the cluster 130 projects have been sponsored. 64 received a total of 154 million Euros of public funding.

<http://www.vehiculedufutur.com/EN/a-french-competitiveness-cluster.html>

### **Pôle de Compétitivité: IDforCAR**

IDforCAR was launched in 2009 and currently has 107 members including 43 large corporations as e.g. PSA and Valeo, 24 SMEs and 33 R&D centres and universities. Its focus themes are product engineering and processes for small volumes, vehicle's components and materials, intelligent on-board equipment, specific usages and client value (i.e. niche vehicles).

<http://www.id4car.org/en/1.aspx>

### **Pôle de Compétitivité: Lyon Urban Truck & Bus**

This cluster was mainly initiated by Renault Trucks, IrisbusFrance and local authorities from Lyon region in 2005. Among its 132 members are 51 large corporations and 59 SMEs. The cluster is working on 5 R&D programmes focusing on public transports and urban transports of goods. It specializes on the research topics Engine and power train, Integrated Safety & Security, Architecture & Comfort, Transport System and Mobility Modeling & Management.

<http://lutb.fr/?lang=en>



### 4.6.3 Funding Programmes

#### **Programme of Research, Experimentation and Innovation in Land Transport (PREDIT)**

PREDIT is a national funding programme carried out jointly by the Ministry of Ecology, Sustainable Development, Transportation and Housing (MEDAD), the Ministry of Higher Education and Research, the Ministry of Economy, Finance and Industry and the Agency for Environment and Energy Management (ADEME), the National Agency of Research (ANR) and by OSEO. The 4<sup>th</sup> constituent and actual version of the PREDIT Programme - PREDIT 4 - was signed in 2008 for a period of five years from 2008 to 2012. A budget of 600 million Euros was allocated for the period of 2009-2011 with 495 million Euros for R&D and 105 million Euros for the establishing of innovation platforms. PREDIT 4 focuses on 6 topics: energy and environment, quality and safety of transportation systems, mobility in urban areas, logistics and freight transport, competitiveness of the transport industry and transportation policy. Especially under the energy and environment topic driving the advancement of electric and hybrid vehicles is intended. So far 200 million Euros have been granted for projects dealing with electric or hybrid vehicles.

Twice a year calls for proposals in R&D on products and services that are close to market introduction are issued. PREDIT finances collaborative R&D projects that are coordinated in clusters.

Moreover PREDIT aims towards European collaboration. Thus, the French-German Cooperation Programme DEUFRAKO provides funding for project proposals of French-German consortia, as well as for dialogue and exchange of knowledge between French and German research communities. Regarding alternative propulsion systems however no such bilateral cooperation programme exists due to the competitive situation between French and German industry. PREDIT also participates in the financing of the "Electromobility +" call of the European ERANET programme and aims to strengthen the French participation in the 7<sup>th</sup> European Framework Programme in general.

<http://www.predit.prd.fr/predit4/english>

#### **Demonstrators of Research Fund - Fonds Démonstrateur de recherche**

This fund was installed on the recommendation of the Grenelle de l'Environnement summit to support the development of research demonstrators on new energy technologies. Six calls for expressions of interest have been issued through ADEME and several more are planned. A call for project proposals for low emission road vehicles was released in 2008 and 11 projects were funded with a total budget of 57 million Euros. The call for this topic was reissued in 2009 after the announcement of the "14 point programme for electric vehicle development". Six additional projects have been selected and receive a total grant of 24 million Euros. In 2010, a second call for this topic with a dedicated budget of 52 million Euros was launched and 12 projects have been selected for funding. Two calls in 2011 focus on R&D and deployment of charging infrastructures. Another call is planned for integration of electric vehicles in mobility services. As of 2010, projects for electric and hybrid vehicles have been supported with 80 million Euros.

<http://www2.ademe.fr/servlet/KBaseShow?sort=-1&cid=96&m=3&catid=22687> (French)

#### **Strategic Investment Fund – Fonds Stratégique d'Investissement (FSI)**

This state-controlled fund provides loans and investments to companies for innovative R&D projects, i.e. the electric trucks of Gruau and the Renault-Nissan-CEA joint venture for developing and manufacturing batteries.

<http://www.fonds-fsi.fr/> (French)

#### **Investments for the Future - Investissements d'avenir**

This programme was launched in 2009 for supporting the French industry to overcome the economic crisis. It intends to facilitate innovations and the development of new technology in France and thus to improve and stabilize its competitive position on the national and global market. For achieving this goal funding is provided to establish laboratories of excellence, studies and R&D projects for global solution of the implementation of electric vehicles. Within the programme 1 billion Euros are dedicated to projects focusing on the "vehicle of the future", which includes electric mobility. The programme is managed by ADEME and the French National Research Agency (ANR). In 2011, a call for project

proposals on traction drives, auxiliary systems and energy storage for electric and hybrid vehicles was published.

<http://investissement-avenir.gouvernement.fr/content/action-projets/les-programmes/transports>

(French)

## 4.7 Germany

### 4.7.1 Vision, Policies and Legislation

In Germany, which is a leading country within the European automotive sector, the automotive industry takes a rather crucial position in society. The automobile sector produces 20% of the German GDP, employs 723.000 people directly and even five million people indirectly. About 1,500 SMEs depend on car manufacturers or their supplying companies. At the same time Germany is car friendly with 44,632 million cars<sup>5</sup>.

In 2007 the **Integrated Energy and Climate Programme** was launched by the Federal Government which aims to pave the way for a modern, secure and climate friendly energy supply. One measure to reach this aim is the promotion of electric mobility in connection with renewable energies. Additionally to climate protection, electric mobility in Germany is seen as enhancing the quality of urban life by reduction of noise and local emissions, to weaken the dependence on oil, and to support the German economy and industry by securing and improving its global competitive position. In 2009 the **National Development Plan Electric Mobility** was released which was prepared jointly by the Federal Ministry for Economy and Technology, the Federal Ministry for Transport, Building and Urban Development, the Federal Ministry for Environment, Nature Conservation and Nuclear Safety and the Ministry for Education and Research. The National Development Plan Electric Mobility sets the aim of one million electric vehicles on German roads in 2020. Furthermore, 500 million Euros were dedicated for R&D on electric vehicles for the period of 2009 to 2011. These funds were made available in 2009 under the second recovery package that was intended to bolster the German industry during the economic crisis. This package included the following actions relevant for electric mobility:

1. Development of a competence centre for electric mobility (realized by the launch of the **Fraunhofer System Research e-mobility**)
2. Establishment of a research centre for strengthening the competence in electrochemistry
3. Launching of an electric mobility R&D programme focusing on energy storage, smart grids and integration of electric vehicles into the smart grid by the Federal Ministry of Economy and Technology
4. Development of production technologies of Li-ion batteries supported by the Federal Ministry for Education and Research
5. Short term implementation of R&D projects targeting electric mobility by the Federal Ministry for Economy and Technology
6. Support of model regions within the **E-Energy programme** implemented jointly by the Federal Ministry for Economy and Technology and the Federal Ministry for Environment, Nature Conservation and Nuclear Safety
7. Field operational tests of passenger and commercial traffic funded by the Federal Ministry of Environment, Nature Conservation and Nuclear Safety
8. Launching of **Electric Mobility Pilot Regions** implemented by the Federal Ministry for Traffic, Building and Urban Development
9. Establishment of a battery testing facility supported by the Federal Ministry for Traffic, Building and Urban Development

Under the National Development Plan the German government also established in 2010 the **National Platform Electric Mobility**, a counseling board for the German federal government consisting of representatives from relevant stakeholders of industry, research institutes, politics and societal

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<sup>5</sup> According to German Association of the Automotive Industry (VDA) [http://www.vda.de/en/zahlen/jahreszahlen/kfz\\_bestand/](http://www.vda.de/en/zahlen/jahreszahlen/kfz_bestand/)

organizations. The platform delivered two reports including key recommendations for the preparation of the **Government Programme Electric Mobility** which was released in 2011 shortly after and in response to the second report of the National Platform Electric Mobility. Part of it is a R&D funding programme with a budget in the order of one billion Euros. In addition to this, additional R&D funding is provided by current programmes at both federal and Länder levels.

#### **Links and References:**

Integrated Energy and Climate Programme

<http://www.bmwi.de/English/Navigation/Energy-policy/energy-and-climate.html>

National Development Plan Electric Mobility

[http://www.bmu.de/files/pdfs/allgemein/application/pdf/nep\\_09\\_bmu\\_en\\_bf.pdf](http://www.bmu.de/files/pdfs/allgemein/application/pdf/nep_09_bmu_en_bf.pdf)

Government Programme Electric Mobility (German)

[http://www.bmu.de/files/pdfs/allgemein/application/pdf/regierungsprogramm\\_emob\\_bf.pdf](http://www.bmu.de/files/pdfs/allgemein/application/pdf/regierungsprogramm_emob_bf.pdf)

Ministry for Environment, Nature Conservation and Nuclear Safety – Electric Mobility

[http://www.bmu.de/english/mobility/electric\\_mobility/doc/44821.php](http://www.bmu.de/english/mobility/electric_mobility/doc/44821.php)

Ministry for Economy and Technology - Electric Mobility

<http://www.bmwi.de/English/Navigation/Economic-policy/Industrial-policy/electric-mobility>

Ministry for Education and Research

<http://www.bmbf.de/en/14706.php>

Fraunhofer System Research e-mobility

<http://www.elektromobilitaet.fraunhofer.de/>

E-Energy Programme

<http://www.e-energy.de/>

Electric Mobility Pilot Regions

<http://www.bmvbs.de/SharedDocs/EN/Artikel/UI/electric-mobility-pilot-regions.html>

#### **4.7.2 Funding Organisations and Relevant Platforms**

##### **Joint Unit for Electric Mobility (GGEMO)**

The Joint Unit for Electric Mobility of the German Federal Government was established in 2010 by the Minister for Economy and Technology and the Minister for Transport, Building and Urban Development with the Ministry for the Environment and the Ministry for Education and Research and the being represented by a dedicated officer. The objectives of the Unit are to coordinate and focus the electric mobility activities of the federal government, especially the implementation and further development of the National Development Plan Electric Mobility. In this regard the Unit also supports the National Platform Electric Mobility.

<http://www.bmwi.de/BMWi/Navigation/Presse/pressemitteilungen,did=329290.html>

##### **National Platform Electric Mobility**

The National Platform Electric Mobility, a counseling board for the German Federal Government, brings together representatives from industry, science, politics, labour unions and society. The platform is organized in seven working groups each consisting of 20 high level representatives, and a coordinating core group formed by the chairperson of each working group and representatives of the

German Federal Government. The Platform was established in 2010 with the objective to consult the German Federal Government and prepare recommendations for the National Development Plan Electric Mobility. In 2010, a first interim report and in 2011 the second report was delivered. The individual working groups focus on drive train technology, battery technology, charging infrastructure and grid integration, standardization and certification, materials and recycling, education and training, and framework requirements.

[http://www.bmu.de/files/english/pdf/application/pdf/bericht\\_emob\\_en\\_bf.pdf](http://www.bmu.de/files/english/pdf/application/pdf/bericht_emob_en_bf.pdf) (First interim Report)

[http://www.bmu.de/files/english/pdf/application/pdf/bericht\\_emob\\_2\\_en\\_bf.pdf](http://www.bmu.de/files/english/pdf/application/pdf/bericht_emob_2_en_bf.pdf) (Second Report)

#### **eNOVA Strategy Board for Electric Mobility**

The eNOVA Strategy Board for Electric Mobility is an alliance of relevant German companies from the automotive industry, batteries, semiconductor components, electrical engineering, and materials sectors. The eNOVA Strategic Board concentrates its work on the electric vehicle in its entirety and the interface to the grid aiming towards the launch and establishment of a platform supporting the German automotive industry on its path to international excellency in electric mobility. eNOVA develops recommendations to the German Federal Government for programmes for pre-competitive R&D regarding electric mobility, and supports the German Federal Government and its Joint Unit for Electric Mobility to implement the National Development Plan Electric Mobility. The office of eNOVA is run by VDI/VDE-IT.

<http://www.strategiekreis-elektromobilitaet.de/english>

#### **Forum Electric Mobility**

The Forum was launched in 2009 by the Federal Ministry for Education and Research and the Fraunhofer Society. It serves as a networking and communications platform for the scientific and societal dialogue on the topic electric mobility.

<http://www.forum-elektromobilitaet.de> (German)

#### **Network of Programme Management Agencies**

All agencies and organisations involved in the management and implementation of German R&D programmes are member of this network. Currently relevant for electric mobility are VDI/VDE-Innovation und Technik (VDI/VDE-IT), VDI Technologiezentrum GmbH (VDI-TZ), Project Management Agency Karlsruhe (PTKA), the Project Management Agency of the German Aerospace Center (DLR), the PT Jülich, NOW GmbH, and the TÜV.

<http://www.ptnetz.de> (German)

#### **German Association of the Automotive Industry (VDA) – Electric Mobility Section**

The VDA nationally and internationally promotes the interests of the entire German automotive industry and considers sustainable and modern mobility as a main objective. Its members are automobile manufacturers, suppliers and manufacturers of trailers, special bodies and buses.

The VDA is active in all areas of the motor traffic industry like economic and transport policy, technical legislation, quality assurance and taxation.

<http://www.vda.de/de/arbeitsgebiete/elektromobilitaet> (German)

#### **Federal Alliance of German Energy and Water Resources Management (BDEW)**

The BDEW was founded in 2007 as the German association of energy providers and water management. The BDEW founded the initiative ELAN 2020 (Electric vehicles intelligently integrated into the network) in cooperation with seventeen companies from diverse fields. The initiative's intention is to simplify the introduction of electric vehicles into the mass market. The initiative mandated three studies regarding potential, controlling and market relevance of the deployment of electric mobility.

[http://www.bdew.de/internet.nsf/id/EN\\_Home](http://www.bdew.de/internet.nsf/id/EN_Home)

### **Central Association of Electrics and Electronics Industry (ZVEI) - Competence Center Electric Mobility**

ZVEI represents the economic, technological and environmental policy interests of the German electrical and electronics industry at the national, European and international levels. In December 2008 the ZVEI founded a competence centre for electronic mobility. Its goal is to support the wide introduction of vehicles with alternative electric engines.

[www.zvei-elektromobilitaet.org](http://www.zvei-elektromobilitaet.org) (German)

### **Federal Association eMobility (BEM)**

BEM, newly founded in 2009, promotes the change to electric mobility in Germany by using renewable energy sources. The responsibilities of BEM include improving the legal framework for the development of electric vehicles as a sustainable and future-oriented mobility concept and the implementation of equal opportunities in the transition to electric vehicles. The BEM intends to link the stakeholders from business, politics and the media together to promote public awareness of electric vehicles and advocate for the necessary infrastructural changes. In particular, the BEM will integrate the fascination for electric vehicles in everyday life and put through practical experience. BEM is sponsored by the Federal Ministry of Economics and Technology.

[www.bem-ev.de](http://www.bem-ev.de) (German)

### **German Association for Electric Road Vehicles (DGES)**

The DGES was founded in 1979. It is the association for all interested in battery, hybrid and fuel cell electric vehicles. The DGES is member in AVERE.

<http://www.dges.de/relaunch/1.html> (German)

### **Federal Association Renewable Energies (BEE)**

In 2009 the German Renewable Energy Federation launched a task force oriented in the field of electric mobility. The working group is composed of various associations like the Association of German biofuels (VDB), the Association of Wind / Energy, the Trade Association for Biogas, the Association of Solar Mobility (BSM), the Federal Solar Industry Association and the German Society for Solar Energy. The task force is coordinated by the BSM and the VDB. The goal is an active support of the widespread introduction of electric vehicles.

<http://www.bee-ev.de/BEE/English.php>

### **Federal Association Solar Mobility (BSM)**

The Association of Solar Mobility is publishing quarterly in the journal "Solar Emobile" about renewals from the field of electric mobility and provides a centralized collection of information on the topic. BSM is one of the main coordinators of the German Renewable Energy Federation (BEE) working group in the field of electric mobility.

[www.solarmobil.net](http://www.solarmobil.net) (German)

### **German Society for Solar Energy (DGS)**

The German Society of Solar Energy has established a technical committee on solar mobility to evaluate concepts for sustainable mobility. It aims to enhance improvements and analyzes the opportunities for an efficient utilization of energy resources in the field of electric vehicles.

The committee of experts was founded in 2006 and since then it has worked on the core issue of how the traffic in cooperation with solar energy technologies and energy resources can be efficiently provided.

[www.dgs.de](http://www.dgs.de) (German)

### 4.7.3 Funding Programmes

#### ICT for Electric Mobility

This programme was released by the German Federal Ministry of Economics and Technology (BMWi) together with the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). The programme is managed by the DLR. Two calls have been launched of which the first one was financed through the second recovery package. The first call within this programme was released in 2009 focusing on:

- ICT based infrastructure for charging, controlling and billing
- Electronic market places and ICT based technical operation of e-mobility concepts and their integration in electric grids
- Electric vehicles for energy storage within the future “e-energy” grid
- Automatic control of the entire system
- Integration of electric mobility into urban or rural traffic infrastructures and user profiles
- Innovative e-mobility services and the investigation of customer acceptance
- Standardization

Seven projects were selected involving 47 companies and scientific research institutes. Between 2009 and 2011 they receive funding of 45.5 million Euros from the BMWi and 9.5 million Euros from the BMU. Since the projects require co-funding from the project partners the total budget invested amounts to more than 100 million Euros.

The second call of the “ICT for Electric Mobility” programme named “Smart Car - Smart Grid - Smart Traffic” was launched with a budget of 77 million Euros in 2011. The focus topic Smart Car targets new ICT-based reference architectures and intelligent building blocks for future electric cars. Thus, complexity shall be reduced and the development and realization of new functionalities within the electric car shall be facilitated. The testing in deployment projects is supported within the Smart Grid – Smart Traffic topic.

<http://www.ikt-em.de/en/index.php>

#### Electric Mobility: Positioning of the new Value Chain (ELEKTRO POWER)

This call, released by the BMWi, funds R&D for novel and innovative battery electric vehicles with regard to all relevant subsystems as well as their integration into the grid and traffic systems. A special focus is set on enhancing and improving the production process. The programme targets energy efficiency, energy management of the entire system, battery development, electronics, and system integration with respect to the whole value chain (raw materials, materials research, and recycling, modules, components and system integration, standardized testing methods, and safety aspects).

<http://www.bmwi.de/BMWi/Navigation/service,did=404700.html> (German)

#### Production oriented Technologies for Electric Vehicle Drivetrains

Focus of this call launched in 2011 by the Federal Ministry of Education and Research (BMBF) are the development of electronic components, electric drivetrains, and production technologies relevant for the fully electric vehicle. The programme is managed by PT-Karlsruhe.

<http://www.bmbf.de/foerderungen/16281.php> (German)

#### Key Technologies for Electric Mobility (STROM)

The STROM programme, a funding programme of the Federal Ministry for Education and Research, has a budget of 90 million Euros within the years 2011-2014. The first call was released in 2010. This call aimed to support the development of innovate electric vehicles including R&D on all relevant components, subsystems and requirements. Special focus was laid on:

- battery and energy storage systems, their integration, controlling and management
- the electric and electronic vehicle architecture including power electronics and functional safety of high voltage components
- electric drive train
- auto body and its adaptation to new drive train concepts

- energy and thermal management including recuperation and range optimization
- Furthermore material and process oriented key technologies are funded:
- Innovative materials for drive train components, power electronics and assembly and joining technology
- novel and powerful double-layer capacitors
- Recycling
- R&D to fast transfer from research to production (e.g. method development and testing)
- R&D to simplification of systems and processes for cost reduction

A third pillar of this call was R&D for future energy storage systems as further development of Li-ion technology as well as alternative battery technologies. Following this call 24 projects were selected to receive 58.85 million Euros funding.

The second call of the STROM programme “Energy efficient and safe electric mobility” launched in 2011 focuses on thermal and energy management and functional safety of components and systems for future electric and plug-in hybrid vehicles. It follows the recommendations for thematic clusters of the working group Drive Train Technologies of the National Platform for Electric Mobility. In detail the call aims at targets regarding energy and thermal management: holistic energy management, efficient operation of all consumers, integration and controlling of recuperation and other energy generating systems, comprehensive thermal management, thermal recuperation and preconditioning as well as innovative methods for heating and cooling. For safety concepts the called topics are: functional safety of components and systems, innovative concepts for EMV and high voltage safety, and safety supporting in-vehicle driver assistance systems. The programme is managed by the VDI-TZ.

<http://www.bmbf.de/foerderungen/14611.php> (German)

<http://www.bmbf.de/foerderungen/16425.php> (German)

### **Electric Mobility Funding Programme of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety**

The programme was launched in 2009 with a total budget of 100 million Euros until 2011 coming from the second recovery package. Funding is dedicated for demonstration and deployment projects of electric mobility for passenger and commercial traffic as well as for R&D for battery recycling. The agency implementing the programme is the VDI/VDE-IT. Focus points for passenger vehicles are development and testing of electric and plug-in hybrid vehicles, development and testing for charging and bi-directional as well as contactless charging. Since start of the programme ten projects for passenger traffic, four projects for commercial vehicles, one project for hybrid busses in public transport and two projects for battery recycling have been funded.

<http://www.pt-elektromobilitaet.de/> (German)

### **Electric Mobility Pilot Regions**

This programme was launched by the Federal Ministry of Transport, Building and Urban Development within the second recovery package. Until the end of 2011, 2,800 electric vehicles shall be deployed and 2,500 charging points shall be installed within eight supported model regions. The electricity is to be supplied from renewable sources.

<http://www.bmvbs.de/SharedDocs/EN/Artikel/UI/electric-mobility-pilot-regions.html>

### **Showcases Electric Mobility**

The Showcases Electric Mobility programme aims at research and development projects with high potentials to raise the public awareness for electric mobility. Visibility and public relation are considered centre pieces of this initiative. Therefore, the funding of 180 million Euros is focused in four regions, where individual yet connected research and development projects are promoted.

VDI/VDE-IT takes responsibility for the programme management relating to the distribution of the German Federal Government's funding sources as well as for the preparation and realization of appropriate public relation measures in order to maximize the achievable publicity.

<http://www.bmw.de/English/Navigation/Press/press-releases,did=486564.html>

## **E-Energy Model Regions**

The Federal Ministry for Economy and Technology and the Federal Ministry for the environment, Nature Conservation and Nuclear Safety together support six model regions for smart grids that also test the smart integration of the electric vehicle in energy grids.

<http://www.e-energy.de/en/32.php>

## **Fraunhofer System Research e-mobility**

33 Fraunhofer Institutes join in this competence network with the focus points:

- Vehicle concepts
- Energy generation, distribution and transformation
- Technologies for energy efficiency
- Technical system integration and socio-political issues
- Functionality, Reliability, Testing and Realization

The network is intended to rapidly build up a comprehensive competence for the system electric mobility and provide this knowledge and know-how for the German industry in order to keep the prime position of the German industry within the automotive sector. The project started in 2009 and is funded with a budget of 30 million Euros from the German Federal Ministry for Education and Research until 2011.

<http://www.elektromobilitaet.fraunhofer.de> (German)

## **4.8 Italy**

### **4.8.1 Vision, Policies and Legislation**

Italy is well suited for electric mobility since Italians living in cities drive approximately 37 km a day on average and only 5 % of all drives exceed 50 km. Furthermore, cars are parked approximately six hours a day. These factors meet the requirements of battery range and recharging. In 2009 the government started legislative initiatives that favour electric cars via incentives and support the development of a charging infrastructure. The actions were mainly induced by European policies of energy efficiency and climate change. However, already before 2009 single projects targeting electric mobility were funded by public programmes. Furthermore, because of uncontrollable pollution in urban areas, regionally the development of infrastructure, provision of extra parking space, and cut of city tolls promoted the use of electric vehicles. In 2009 a large “scrappage-park renewal” programme was launched because of the global financial crisis. The incentives depended on CO<sub>2</sub> emission and vehicle size.

### **4.8.2 Funding Organisations and Relevant Platforms**

#### **Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA)**

ENEA was established in 2009 replacing the Italian National Agency for New Technologies, Energy and the Environment. It manages and performs research activities targeted at research, innovation technology and advanced services in the fields of sustainable economic development and energy, especially nuclear energy. Also agency services are provided in support of public administrations, public and private enterprises, and citizens.

<http://old.enea.it/com/ingl/default.htm>

#### **National Research Council (CNR)**

The CNR is a public organization consisting of a network of institutes distributed all over Italy. The CNR carries out, promotes, spreads, transfers, and improves research activities in the areas: biotechnology, medicine, materials, environment and land, information and communications, advanced



systems of production, judicial and socio-economic sciences, classical studies, and arts. The CNR is mainly funded by the state.

<http://www.cnr.it/sitocnr/Englishversion/Englishversion.html>

#### **Italian Commission for Electric Vehicles (CIVES)**

CIVES is a non-profit institution, established as a special committee of the Italian Electrotechnical Committee (CEI), the Italian authority in charge of technical standards in electrical and electronic products on behalf of the Ministry of Industry. CIVES is the Italian section of AVERE, the European association for battery, hybrid and fuel cell electric vehicles.

<http://www.ceiweb.it/CIVES/home.htm> (Italian)

#### **TORINO e-District “Rete di Imprese”**

TORINO e-District is a legal entity including a cluster of SMEs and large companies located in the Piedmont Region that are involved in electric mobility. Its objectives are the development of enabling technologies with a focus on small and light electric vehicles, the definition of collaboration strategies aiming at a fast adoption of the developed solutions, and the integration of its members into the growing international supply chain covering the enabling technologies for electric mobility. Torino e-district is supported by La Provincia Di Torino.

#### **Italian Technology Platform for Electric Mobility**

A national platform for electric mobility was started in 2010 with the participation of about 100 stakeholders (industries, research organizations and academia) with the scope of elaborating a strategy and long-term actions. The Italian Electrified Mobility Platform aims to proactively define the innovation needs for effective urban mobility, to help Italian industry provide new products and national infrastructures and to coordinate European national efforts. The plan would be implemented over the next 5 to 10 years.

### **4.8.3 Funding Programmes**

#### **Industry 2015**

The programme launched in 2008 under the authority of the Ministry of Economic Development intends to promote innovation in the Italian industry, and hereby targets private sector enterprises of various sizes as well as research institutions for co-financing of selected projects. Among other areas sustainable mobility, industrial energy efficiency and use of renewable energy are focused on. In December 2008, 26 sustainable mobility projects were selected to be financed with a total budget of 380 million Euros of which 50 million Euros went to electrification projects.

<http://www.industria2015.ipi.it/>

## **4.9 Netherlands**

### **4.9.1 Vision, Policies and Legislation**

The Netherlands are ambitious to take a leading role in fostering the breakthrough of electric mobility. Reasons are the desired independence from oil, reduction of CO<sub>2</sub> by 20% in 2020, cleaner air regarding fine particles and NO<sub>x</sub> emissions and noise reduction in urban areas. Additionally, the Netherlands have internationally competitive component suppliers as well as widely respected automotive expert and research centres which are expected to strive on the new opportunities and innovations related to electric mobility. The national environmental goals are defined in the **Clean and Efficient Programme**, which sets the objective of reducing CO<sub>2</sub> emissions in 2020 to the level of 1990, and by the **Energy Innovation Agenda** which aims for the Netherlands having one of the most efficient transport systems in Europe by 2020. In 2009 the **Government Action Plan for Electric Driving** was released intending to prepare a future large-scale market introduction. The central government will contribute up to 65 million Euros planning to stimulate a total investment of 500 million Euros by other stakeholders as e.g. market parties, social organisations as well as local and regional

authorities. The Government Action Plan for Electric Driving schemes the establishment of a platform of all industrial stakeholders (the Formula-E-team), as well as practical measures for demonstration projects, infrastructure development, R&D for vehicle and components technology, support of consortium and coalition formation, promotion of electric transport among potential customers, and ancillary policies. In the Action Plan the market development phase was outlined in four programme stages. In the initial programme stage from 2009 until 2011 measures of the Action Plan regarding R&D and demonstration projects are implemented, followed by the second programme stage, the upscaling phase until 2015 where the programme measures are taking effect and about 15,000 to 20,000 electric vehicles are planned to be sold. A consolidating phase will continue this market roll-out reaching 200,000 electric vehicles on Netherlands' roads until 2020. After 2020 the market will mature, and the number of electric vehicles is expected to rise to 1,000,000. At this point governmental programmes will be scaled down. There are various incentives for purchasing and driving electric vehicles provided by Dutch national, local and regional administrative authorities. On national level there is a tax relief for the purchase of commercial electric vehicles and recharging posts. There are further tax exemptions for purchase and also road usage, as well as for income tax for company car drivers. The municipalities of Amsterdam, Leeuwarden and Rotterdam installed additional subsidies for purchasing electric vehicles and recharging posts. The province of Noord-Brabant fosters projects targeting electric driving and smart grids.

As further incentives electric vehicles are exempt from road and registration tax and companies purchasing electric vehicles can get a rebate of up 8,000 Euros.

### **Links and References**

Clean and Efficient Programme: New Energy for Climate Policy

<http://www.rijksoverheid.nl/.../11br2007g486-2008122-154154.pdf>

Energy Innovation Agenda

[http://www.nwo.nl/.../Energy Innovation Agenda.pdf](http://www.nwo.nl/.../Energy%20Innovation%20Agenda.pdf)

Government Action Plan for Electric Driving

[http://www.agentschapnl.nl/.../Action Plan for Electric Driving.pdf](http://www.agentschapnl.nl/.../Action%20Plan%20for%20Electric%20Driving.pdf)

Summary - Progress of Electric Vehicles Action Plan

[http://www.agentschapnl.nl/.../Summary - progress of electric vehicles action plan.pdf](http://www.agentschapnl.nl/.../Summary%20-%20progress%20of%20electric%20vehicles%20action%20plan.pdf)

Action Plan for Electric Transport

[http://www.agentschapnl.nl/.../Action Plan Electric Transport.pdf](http://www.agentschapnl.nl/.../Action%20Plan%20Electric%20Transport.pdf)

### **4.9.2 Funding Organisations and Relevant Platforms**

#### **Formula E-team**

The Formula E-team is a collaboration of industry, institutes and administration aiming to support the establishment of the conditions for a broad market penetration of electric vehicles. Focus points are safety, infrastructure, and batteries, ensuring a significant supply of electric vehicles, international collaboration regarding compatible infrastructure, R&D projects and pilots. The Formula E-team was installed to considerably contribute to the coordination and facilitation of the market introduction of electric mobility.

<http://www.agentschapnl.nl/en/onderwerp/formula-e-team>

#### **NL Agency**

The NL Agency under the authority of the Dutch Ministry of Economic Affairs, Agriculture and Innovation implements governmental programmes, regulations and laws with the focus on sustainability, innovation and international business cooperation. It also serves as a contact point for

knowledge institutions and government bodies providing information, advice, financing, networking and regulatory matters. It supports the Formula E-team.

<http://www.agentschapnl.nl/en>

### **E-laad**

E-laad is a foundation of Dutch power grid operators planning to install 10,000 charging points by 2012. Activities include mapping of driving and charging behaviour, test and pilot projects, and involvement in standardization activities.

<http://www.e-laad.nl/> (Dutch)

### **c,mm,n**

c,mm,n is a cooperative venture between the Netherlands Society for Nature and Environment (Stichting Natuur en Milieu), Delft University of Technology, Eindhoven University of Technology and University of Twente and some thirty industries and other organisations. c,mm,n is an open-source community for sustainable individual mobility. New concepts of mobility are developed by c,mm,n. Amongst others the Action Plan for Electric Transport has been proposed.

<http://www.cmmn.org/en/>

### **D-incert**

The Dutch Innovation Centre for Electric Road Transport (D-incert) has been founded in 2008 by the three Dutch Universities of Technology (TU Eindhoven, TU Twente and TU Delft) and the Universities of Applied Sciences from Rotterdam and Arnhem/Nijmegen (HRO and HAN). Main activities of D-incert are network events and workshops for companies, universities and research institutes, knowledge brokering, opportunity recognition and project initiation, R&D and innovation roadmapping and longer term agenda setting in the Netherlands.

<http://www.d-incert.nl/>

### **AutomotiveNL**

From January 1, 2012, HTAS Automotive Innovation has merged, together with Automotive Technology Centre (ATC) and HTACampus, into a new organization under the name AutomotiveNL. Automotive NL is the cluster organisation for the Dutch automotive sector. AutomotiveNL supports the Dutch Automotive sector in its ambition of growing from the present turnover of 17 billion Euros to 24 billion Euros and from 45,000 jobs at present to 55,000 in 2020, and of doubling the number of automotive students. Amongst other activities, AutomotiveNL is active in initiation and programme management of innovation and valorisation projects. Promotion of electric powertrains is further on a dedicated part of their agenda.

<http://www.automotivenl.com/en/>

### **DOET - Dutch Organisation for Electric Transport**

The mission of DOET is to accelerate the introduction of electric vehicles in the Netherlands through a collaboration of entrepreneurs with a core business in electric transport. DOET provides advice on policies regarding electric mobility to the government. It promotes and encourages collaboration and knowledge sharing among its members and actively engages in the public debate on electric vehicles. DOET furthermore launched projects and demonstrations for the promotion of electric mobility and works on increasing the market for its members e.g. by providing an online route planner and overview of charging stations in the Netherlands.

<http://www.doetdoet.nl/>

### **4.9.3 Funding Programmes**

#### **Testing Ground Programme**

47 proposals have been made in response to a tender for projects focusing on the pre-market introduction phase and on testing electric vehicles in everyday situations. Ten million Euros have been granted to nine demonstration projects for the next two years.

#### **High Tech Automotive Systems – Electric Vehicle Technology Programme (HTAS EVT)**

The HTAS, now merged into AutomotiveNL, set up a market-driven programme focusing on areas of strength within the Dutch automotive industry as well as on future opportunities and challenges. The programme is directed by the Dutch automotive industry, and was planned to run five years. In 2009 a sub-programme for electric vehicle technology was added. Until the summer of 2010, 15 million Euros were granted to ten projects which are currently starting up.

<http://www.htas.nl/index.php?pid=136>

### **4.10 Poland**

#### **4.10.1 Vision, Policies and Legislation**

Currently the setup of a governmental electric mobility development programme is being discussed in Poland regarding its content, instruments and budget. Major goal for the introduction of electric mobility is the wish for more autonomy on fuel supply and the independence from oil. Research within this programme is planned to be focused on strictly defined products which should build a basis for following test and demonstration projects. This R&D policy should be synchronized to European and international programmes.

#### **4.10.2 Funding Organisations and Relevant Platforms**

##### **Polish Road Transport Technology Platform**

In Poland a number of Technology Platforms were created under the 7<sup>th</sup> Framework Programme to settle an effective public and private partnership for the implementation of European and national R&D strategies. Their aim is to prepare national R&D programmes concerning strategic economy sectors, and to actively participate in European Technology Platforms, and hence, in the definition and implementation of European Strategic Research Agendas. Furthermore, they shall provide a network at national level for the key research partners among industries, economy chambers and agencies as well as scientific institutions and universities, guarantee an optimal use of structural funds, and engage in promotion and lobbying of R&D activities. The Technology Platforms are supported by the principal ministries of Polish science and economy: the Ministry of Science and Higher Education, the Ministry of Economy, the Ministry of Agriculture and Rural Development, the Ministry of Environment, Ministry of National Defence, the Ministry of Internal Affairs and Administration. The Road Transport Technology Platform is a member of ERTRAC.

<http://www.ibdim.edu.pl/eng/>

##### **National Centre for Research and Development (NCBiR)**

The NCBiR, which is financed from national and European budgets, manages and implements strategic scientific R&D programmes which lead to innovative technologies and products. It focuses on commercialization and market introduction of scientific results. Additionally, the NCBiR is in charge of ERA-NET and EUREKA projects.

<http://www.ncbir.pl/en/>

##### **Polish Society for Ecological Vehicles (PTPE)**

The PTPE aims to bring together persons and teams dealing with the problems of research, construction and use of ecological vehicles, transportation systems and their power supplies. It collaborates with scientific research entities, associations, enterprises and appropriate bodies of state

authority and administration. Furthermore, the PTPE gathers information for compilation into an electric vehicle related data base, distributes electric vehicle relevant information and disseminates research results. Another main objective of the PTPE is the cooperation with international and foreign associations and organizations in order to exchange experience and present Polish achievements in the field of research, construction and use of ecological vehicles, transportation systems and their power supplies.

[ptpe.simr.pw.edu.pl](http://ptpe.simr.pw.edu.pl) (Polish)

#### 4.10.3 Funding Programmes

##### IniTech Call

The IniTech call with a total budget of 10 million Euros was released by the Minister for Science and Higher Education and managed by the National Centre for Research and Development. It has been launched in 2009 and 74 projects started in 2010 with a dedicated budget of 5.2 million Euros. 10% of these projects targeted clean transport solutions.

<http://www.ncbir.pl/programy-krajowe/initech> (Polish)

##### National Programme of Research and Development (KPBniPR)

Under the national programme of research and development ("Krajowego Programu Badań Naukowych i Prac Rozwojowych") national projects of diverse technology and scientific fields are funded with a total budget of 50 million Euros. A number of them are related to electric vehicles. The National R&D Works Programme details in its research area „Energy and infrastructure” the subarea „Safe, effective and ecological means of transport” where intelligent transport modes and infrastructure are one topic relevant to electric mobility as well as the subarea “Development of intelligent transport systems and implementation of ICT technologies allowing decreasing of volume of vehicles and increasing of effectiveness of urban and suburban transport”.

<http://www.bip.nauka.gov.pl/.../KPBniPR.pdf> (Polish)

## 4.11 Portugal

### 4.11.1 Vision, Policies and Legislation

Portugal is importing most of its energy because it does not have domestic fossil fuel resources. As of the end of 2009, 43% of the energy produced in Portugal comes from renewable sources. Hence, Portugal is interested to electrify the whole mobility system. Therefore, an integrated strategy has been implemented in order to make electric vehicles a viable option in Portugal's major cities by the end of 2011. The government estimates that by 2020 180,000 electric vehicles will be on the road and 25,000 charging stations will be available in the network. Portugal's vision is to be a pioneer and a space for conceiving, developing and testing of electric mobility. Energy from renewable sources shall be exploited through intelligent networks.

In 2008 the **Portuguese National Energy Efficiency Action Plan (PNAEE)** also designated "**Portugal Efficiency 2015**", was launched aiming at an increase in energy efficiency by about 10% of the total energy consumption. It complements the National Climate Change Programme (PNAC) and the National Allocation Plan for Emission Allowances (PNALE) covering the sectors transport, residential and services, industry and state, and targets behaviours, taxes, incentives and financing. Twelve action programmes aim to stimulate the use of new technologies, the improvement of organisational processes and the change in behaviour and values leading to more sustainable consumption habits. Measures within the transport sector are to reduce the number of old vehicles, reduce the CO<sub>2</sub> emissions of new sold cars and improve intelligent traffic management and promote and improve public transport. In 2010 the Portuguese **Energy Strategy (ENE 2020)** was released which paves the way for achieving the European 2020 Climate goals and furthermore aims for reducing the dependence on foreign energy to 74%. ENE 2020 also details the deployment of electric mobility and intelligent networks under the topic of energy efficiency.

Under the National Energy Efficiency Action Plan in 2009 the **Programme for Electric Mobility** was created. The popularization of the electric vehicle shall be reached through the development of a service model that allows the use of electric vehicles without any disadvantages compared to conventional cars to any individual or entity. Moreover the charging infrastructure and a park of electric vehicles shall be established. The Programme for Electric Mobility is responsible for defining concepts and service and business models for electric mobility, an adequate legal and regulatory framework, as well as the guidelines for the technical solution for the charging network and management system. Portugal is one of the first countries in the world to have an integrated policy for electric mobility and a national charging network for electric vehicles.

Currently, incentives for electric vehicles are the exemption from circulation and registration tax and a bonus of up to 1,000 Euros for the purchase of cars with CO<sub>2</sub> emissions of less than 140 g/km.

### **Links and References**

Portuguese National Energy Efficiency Action Plan:

[http://www.adene.pt/.../CouncilofMinistersResolution80\\_2008PNAEE.pdf](http://www.adene.pt/.../CouncilofMinistersResolution80_2008PNAEE.pdf)

Energy Strategy (ENE 2020)

[http://www.renewable.pt/.../PoliticaEnergetica\\_v1/Pages/Eficiencia.aspx](http://www.renewable.pt/.../PoliticaEnergetica_v1/Pages/Eficiencia.aspx)

Programme for Electric Mobility

[http://www.umic.pt/images/stories/publicacoes4/RCM\\_20\\_2009.pdf](http://www.umic.pt/images/stories/publicacoes4/RCM_20_2009.pdf) (Portuguese)

#### **4.11.2 Funding Organisations and Relevant Platforms**

##### **Portuguese Electric Vehicle Association (AVPE)**

The Portuguese Electric Vehicle Association (APVE) is a non-profit, nationwide organization, established in 1999, whose mission is to promote the wider use of vehicles with electric propulsion, (Battery, Hybrid and Fuel Cell) an integrated transport policy and sustainable mobility.

<http://www.apve.pt/>

##### **Office for Electric Mobility (GAMEP)**

The Office for Electric Mobility has been established within the Portuguese Ministry of Economy with direct connection to the Prime Minister's Office Under the coordination of the Office for Electric Mobility (GAMEP) a specific legislative package establishing a well-defined, yet flexible, framework for electric mobility was introduced in April 2010, based on MOBI.E. The legislation package is designed to attract private investors by lowering barriers for business stakeholders

##### **Energy Agency (ADENE)**

ADENE is a public non-profit institution. The Energy Agency's mission is to promote and carry out activities of public interest in the energy sector and its interfaces with other sectorial policies. Current activities include the National Action Plan for Energy Efficiency (NEEAPs), as well as interventions in the areas of Demand Management and Renewable Energy with major players in the Portuguese energy market.

<http://www.adene.pt>

##### **Centre for Excellence and Innovation in the Automotive Industry (CEIIA)**

The CEIIA is a private entity that associates the main Portuguese Associations, Technical Universities, R&D Centres, Public Agencies and Suppliers from the automotive and aeronautical industry. The Centre for Excellence and Innovation in the Auto Industry is a driving force behind the electrification of the auto industry in Portugal, while also playing a defining role in the engineering development and design of the charging stations being installed.

<http://www.ceiia.com>

## **INTELI**

INTELI is a private non-profit organization. It heads the major Portuguese electric mobility programme in Portugal, MOBI.E, and is the coordinator of a European consortium that intends to demonstrate the readiness of electric mobility within the MOBI.Europe project.

<http://www.inteli.pt/en>

### **4.11.3 Funding Programmes**

#### **Energy Efficiency Fund**

This fund with an initial budget of 1.5 million Euros aims to encourage efficiency by citizens and businesses, to support energy efficiency projects in areas where until now such projects had not yet been developed, and to promote behavioural change in this area. Technology-oriented projects are funded.

[http://www.governo.gov.pt/pt/GC18/Noticias/Pages/20100318\\_CM\\_Energia.aspx](http://www.governo.gov.pt/pt/GC18/Noticias/Pages/20100318_CM_Energia.aspx)

#### **MOBI.E - Portuguese Electric Mobility**

The Programme focuses on the user aiming for fair, advantageous and competitive pricing, universal access, openness to manufacturers and operators. Its main initiatives are a 20 % annual renewal of the public car fleet, priority lanes and parking spaces, public funding for pilot infrastructure, communication and education, tax exemption for electric vehicle acquisition, tax reduction for private and company fleets, 5,000 Euros direct subsidy on purchase. 25 of 300 municipalities are involved in the pilot infrastructure network as well as the main highways. 1,300 slow charging stations and 50 fast charging stations are planned to be completed in the summer 2011. A total of 320 charging stations were installed in the MOBI.E network in 2010.

<http://www.mobie.pt/en/homepage>

#### **MOBI.CAR**

Within the MOBI.CAR programme, Portugal's 100% electric vehicle is to be developed. The roll out is expected in 2012. With a range on a single charge of 120 km and a top speed of 100 km/h, the three-seat compact vehicle is being developed at the CEIIA in Porto, in collaboration with Spain's CTAG, among other entities, companies, and universities.

## **4.12 Spain**

### **4.12.1 Vision, Policies and Legislation**

Spain is strongly dependent on fuel imports and its energy consumption is constantly rising. The transportation sector is responsible for the biggest part of Spain's total energy consumption and its energy usage is also increasing disproportionately high compared to other sectors. Furthermore, Spain exhibits the highest percentage in Europe of increase in travelled highway miles and cars per inhabitant indicating the constantly rising fuel consumption. Hence, maybe more than in other European countries Spain is interested in shifting to electric mobility and energy efficient transport to reduce its CO<sub>2</sub> emissions, and also to dramatically reduce the dependence on oil. The Spanish government estimates that moving to electric mobility will reduce Spain's dependence on imported energy sources by more than 20%, halve the amount of imported oil and save 81 Mt CO<sub>2</sub> per year. It set itself the goal of one million electric and hybrid vehicles on Spanish roads in 2014.

In 2004 the Spanish government passed the Spanish **Strategy for Energy Savings and Efficiency 2004-2012 (E4)**. Under this strategy two action plans were implemented for 2005-2007 and for 2008-2011. These action plans detail the measures and instruments to be employed for achieving the objectives of the E4. Additionally, in 2008 the **Energy Saving and Efficiency Strategy Action Plan 2008-2012 (PAE4+)** was approved which should strengthen the impact of the Action Plan of 2008-2011. These policies led to the following measures concerning electrification of road transport:

- Urban Mobility: Funding for mobility plans, bicycle lending systems, conducting feasibility and follow-up studies on mobility measures, pilot trials.
- Company Transport: Funding for studies of transport plans in companies or industrial estates, health-care and educational establishments, shopping centres, etc., pilot projects.
- Renewal of Road Transport Fleets: Establishment of minimum quality criteria for fleets for the granting of licences to collective passenger transport companies or road haulage firms. Development of a system of labelling for industrial vehicles. Financial assistance to mitigate the extra cost of alternative vehicles in relation to equivalents with traditional designs and engine types.
- Renewal of the stock of cars: Financial assistance to mitigate the extra cost of alternative vehicles as compared to equivalents using traditional designs and engine types.

In 2010 the **Integral Plan for the Promotion of Electric Vehicles in Spain** has been prepared and finalized by the government, regional and local authorities, car manufacturers and auxiliary industry, the energy sector and technology companies. The objective of this strategy is to reach 70,000 electric vehicles in 2012 and 250,000 electric vehicles and Plug-In hybrids and 750,000 hybrid vehicles in 2014. In 2011 and 2012 a total public funding budget of 590 million Euros will be available. Of this budget 240 million Euros are set aside for incentives for the acquisition and use of electric vehicles. Industrialization plans focused on electric vehicles will be supported with 140 million Euros, innovation regarding ICT for electric vehicles is funded with 35 million Euros and R&D on priorities for the electric vehicle development will be fostered with 173 million Euros. The Integral Plan for the Promotion of Electric Vehicles in Spain includes the “Comprehensive Strategy for EV Promotion in Spain 2010-2014” and the “Action Plan 2010-2012 (Plan Movele)”, which establishes a budget, responsibilities, and objectives for the short term. The Spanish government also installed incentives for the promotion of low-emission vehicles. Vehicles with CO<sub>2</sub> emissions of less than 120 g CO<sub>2</sub>/km are exempt from the registration tax.

## Links and References

Strategy for Energy Savings and Efficiency 2004-2012 (E4)

<http://www.idae.es/index.php/id.67/reلمenu.331/lang.uk/mod.pags/mem.detalle>

Energy Saving and Efficiency Strategy Action Plan 2008-2012 (PAE4+)

<http://www.idae.es/index.php/id.67/reلمenu.333/mod.pags/mem.detalle>

2nd Spanish Energy Efficiency Action Plan 2011-2020 – Executive Summary

[http://www.idae.es/.../PAEE\\_2011\\_2020\\_Executive\\_Summary.pdf](http://www.idae.es/.../PAEE_2011_2020_Executive_Summary.pdf)

Integral Plan for the Promotion of Electric Vehicles in Spain

<http://www.minetur.gob.es/.../estrategiaintegralvehculoelctrico.pdf> (Spanish)

### 4.12.2 Funding Organisations and Relevant Platforms

#### Institute for Diversification and Saving of Energy (IDAE)

IDEA, a state-owned business entity that reports to the Ministry of Industry, Tourism and Trade through the State Secretary for Energy, is committed to achieving the targets set by the 2007-2012 Action Plan under the Spanish Energy Saving and Efficiency Strategy and those of the Renewable Energy Plan for 2005-2010. It coordinates and manages the measures and funds destined for these plans jointly with the autonomous regions of Spain. IDAE works to increase the public knowledge and awareness. It provides technical advice, and runs and finances example technology innovation projects with potential for replication. The institute is internationally active in the framework of various European programmes and cooperation programmes with third countries.

<http://www.idae.es/index.php>



### **Centre for Industrial Technology Development (CDTI)**

The CDTI, a public organisation under the Ministry of Science and Innovation, aims to help Spanish companies to increase their technological profile. CDTI grants financial help to companies of its own and facilitates access to that of third parties for the execution of both national and international research and development projects. Furthermore, it promotes technology transfer and technological cooperation between enterprises, and supports and manages the involvement in international R&D activities.

<http://www.cdti.es/index.asp>

### **Technological Institute Foundation for Security in the Automobile (FITSA)**

FITSA was created in 2001 by AECA ITV (Spanish Association of Collaborating Entities of the Administration in the Vehicles Technical Inspection), ANFAC (Spanish Association of Automobile and Trucks manufacturers), and SERNAUTO (Spanish Association of Automotive Equipment and Components Manufacturers) with the support of the Ministry of the Interior, and the Ministry of Science and Innovation. Its objective is the promotion of innovation in security and environment in the automobile and encouraging the social demand for these values. FITSA has the vision of a safe and environmentally friendly automotive fleet supporting "zero dead or seriously injured" in accidents. In this perspective FITSA promotes the introduction of electric vehicles.

<http://www.fundacionfitsa.org/presentacion.sub.eng.php?id=0000012>

### **Move to Future (M2F)**

Move to Future is a technology platform developed from the Spanish Automotive Technology Platform, SERTEC. It now also includes stakeholders from infrastructure, intelligent transport systems, the energy sector etc. M2F has a working group focused on vehicle electrification. It is promoted by the Ministry of Science and Innovation (MICINN) through public and private shared cost funding.

<http://move2future.es/> (Spanish)

### **Road Technology Platform (PTC)**

The Road Technology Platform is promoted by the Ministry of Science and Innovation (MICINN). PTC is concerned mainly with the Spanish road infrastructure. Its objectives are the definition of a strategic vision for technological activities in the Spanish road sector, the stimulation of stakeholder cooperation by optimizing existing R&D investments and promoting new R&D projects, building R&D guidelines and long-term priorities, facilitating cooperation with national and international bodies, and encouraging knowledge transfer and good-practice exchange between the relevant stakeholders.

[www.ptcarretera.es/home.html](http://www.ptcarretera.es/home.html)

### **FP7 Green Cars Spain**

The FP7 Green Cars Spain is a coordination and support action for fostering the Spanish participation in the European Green Cars Initiative. The action is funded by the CDTI (Interempresas Internacional Programme). It distributes information, organizes events and disseminates Spanish priorities and capabilities.

<http://www.fp7greencars.es/index.aspx?idioma=EN>

### **FOREVE – The Spanish Forum for the Electric Vehicle**

The forum's objective is matching companies and organizations interested in the introduction of electric mobility in Spain. The Technological Institute Foundation for Security in the Automobile (FITSA) and the Institute for Energy Diversification and Saving of Energy (IDEA) promote and support FOREVE.

<http://www.foreve.es/en/index.html>

### 4.12.3 Funding Programmes

#### **CENIT Programme (National Strategic Consortia for Technological Research)**

The CENIT was launched in 2006 by the Ministry of Science and Innovation and carried out by CDTI ended in 2010. It was intended to stimulate public-private partnership and to support major R&D Projects of large-scale consortia for strategic industrial research in order to generate innovation and expertise to strengthen the competitive position of the Spanish industry. The programme fostered 91 projects with grants of 1,071 million Euros. The programme generated a total investment of 2,298 million Euros and involved more than 1,250 companies and 1,580 research groups. One project for electric vehicles, CENIT VERDE, is funded with 34 million Euros from 2009-2012.

<http://www.cdti.es/index.asp?MP=15&MS=604&MN=3>

#### **Competitiveness Programme for the Automotive Sector**

The Competitiveness Programme for the Automotive Sector, funded by the Spanish Ministry of Industry, Tourism and Trade, promotes R&D projects and investments that aim towards a reorientation of production to more sustainable, more efficient and safer vehicles. In 2009, five projects on electric vehicles and seven projects on hybrid vehicles were supported with a total of 70 million Euros. In 2010 again 16 projects on electric and hybrid vehicles were promoted with loans of 30.5 million Euros.

<http://www.minetur.gob.es/Portalayudas/automocion/concesion/Paginas/concesion.aspx> (Spanish)

#### **MOVELE Project**

MOVELE is the Spanish electric mobility pilot project that was defined in the Energy Saving and Efficiency Strategy Action Plan 2008-2012 (PAE4+). MOVELE was started in 2009 with funding by the Institute for Energy Diversification and Saving (IDAE). The objective of MOVELE is the demonstration of the technical and economic feasibility of electric mobility including the related infrastructure. Furthermore, electric mobility and public private collaboration in this field shall be promoted. The aim is to introduce 2000 electric vehicles and at least 500 charging spots in urban environments. MOVELE has a budget of 10 million Euros of which 8 million Euros are intended for the acquisition and use of electric vehicles and 2 million Euros are dedicated for the public charging infrastructure and project management. In March 2011, 1,530 vehicles had been acquired with an average support of 2,843 Euros.

<http://www.movele.es/>

## 4.13 Sweden

### 4.13.1 Vision, Policies and Legislation

The growing competition on the global automotive market, the need to reduce greenhouse gas emissions and the reduction of the dependence on fossil fuels are the challenges faced by the Swedish transport sector, especially by the rather large Swedish automobile industry. Sweden set the goal of being independent of fossil fuels by 2030. This is an important step towards the long-term goal to become an emissions-neutral country by 2050. The Swedish public shows great interest in low-carbon vehicles. The sales share of low carbon vehicles among passenger cars rose from 13% in 2007 to 38% in 2009. However, only a small amount of these low-carbon cars are hybrids or electric vehicles. At the end of 2009, of the total fleet of 4,300,000 passenger cars 16,200 were hybrids and 310 electric vehicles. The Swedish government installed incentives for the promotion of purchasing electric vehicles. Hybrid vehicles with CO<sub>2</sub> emissions of 120 g/km or less and electric cars with an energy consumption of 37 kwh per 100 km or less are exempt from the annual circulation tax for a period of five years from the date of their first registration. For electric and hybrid vehicles, the taxable value of the car for the purposes of company car taxation is reduced by 40% compared with the corresponding or comparable petrol or diesel car. Furthermore, 85% of vehicles purchased or leased by public authorities per year are required to be eco vehicles. Locally, also parking charges are reduced for electric vehicles, and in Stockholm electric vehicles and Plug-In hybrids are exempt from the congestion tax. In May 2009 the Swedish Energy Agency delivered the report “**Knowledge Base**

**for the Market in Electric Vehicles and Plug-in Hybrids”** to the Swedish government which in turn installed a four year programme for the promotion of electric vehicles. Since January 2011, vehicle taxes have been based on several factor including weight, fuel, and carbon dioxide emissions, all of which being advantageous for electric vehicles. In January 2012 an additional programme has become effective that will provide subsidies for the purchase of electric cars and other "super green cars" with ultra-low carbon emissions of less than 120 g CO<sub>2</sub>/km. The new programme amounts to 23 million Euros and will last for three years. Currently, the promoted aim is to have 600,000 electric vehicles on the nation's roads by 2020. The Government's long-term objective is for Sweden to have a vehicle fleet that is independent of fossil fuels by 2030.

### **Links and References**

Knowledge Base for the Market in Electric Vehicles and Plug-in Hybrids

[http://www.energimyndigheten.se/.../Report on electric vehicles and plug-in hybrids.pdf](http://www.energimyndigheten.se/.../Report%20on%20electric%20vehicles%20and%20plug-in%20hybrids.pdf)

A Sustainable Energy and Climate Policy for the Environment, Competitiveness and long-term Stability

<http://www.sweden.gov.se/content/1/c6/12/00/88/d353dca5.pdf>

Press Release: "Super-green car rebate"

<http://www.sweden.gov.se/sb/d/5745/a/174866>

### **4.13.2 Funding Organisations and Relevant Platforms**

#### **Swedish Energy Agency**

The Swedish Energy Agency is working for the government on national energy policy issues in order to establish a secure, environmentally-friendly and efficient energy system. Thus, the Agency supports the achievement of national climate targets, promotes an economical, resource efficient energy system with an increasing share of renewable energy.

<http://www.energimyndigheten.se/en/>

#### **Swedish Electric Mobility Initiative (SEMI)**

The Swedish Electric Mobility Initiative (SEMI) project, run by the Power Circle cluster, is working for the widespread introduction of vehicles powered by electricity from renewable sources in Sweden. It aims to have 600,000 electric vehicles on the nation's roads by 2020.

<http://www.powercircle.org/en/display/Projects/swedish-electric-mobility-initiative.aspx>

#### **Region Vastra Gotaland**

Vastra Götaland is a western Swedish county consisting of 49 municipalities with a large number of automotive industries. The Region Västra Götaland drives development within this county in cooperation with trade, industry, organisations and academia.

<http://www.vgregion.se/en/Vastra-Gotalandsregionen/Home>

#### **Fouriertransform AB**

Fouriertransform, a state-owned venture capital company, works on a commercial basis to strengthen the international competitiveness of the Swedish automotive cluster. In this endeavour Fouriertransform AB actively takes the role as an owner, and contributes expertise by placing qualified representatives on the boards of the companies in which it holds an interest. One example relevant to electric vehicles is Alelion Batteries AB.

<http://www.fouriertransform.se/en/>

### **Vinnova - Swedish Governmental Agency for Innovation Systems**

VINNOVA, established in 2001, aims to increase the competitiveness of Swedish researchers and companies by promoting sustainable growth, funding needs-driven research and the development of effective innovation systems. For building and maintaining a strong innovation system that is networked between companies, universities, research institutes and other organisations, long-term investment in strong research and innovation milieus are made. Furthermore, catalytic meeting places are created by organizing conferences and seminars. VINNOVA is an agency under the Ministry of Enterprise, Energy and Communications and the national contact agency for the EU Framework Programme for R&D.

<http://www.vinnova.se/en/>

### **Swedish Research Council – Formas**

Formas supports basic research, develops strategies, develops analysis and communicates research information and results. Within these activities Formas aims for international collaboration. The focus areas are environment, agricultural sciences and spatial planning. The electrification of the transport system coupled to issues of renewable energy, sustainable cities and smart grids belongs to Formas' strategic research agenda.

<http://www.formas.se/en/>

### **Sustainable Innovation AB (Sust)**

Sust, owned by the Association for Energy Efficiency, is a national center for energy efficiency in everyday life. It gathers companies, researchers, entrepreneurs and government agencies, and supports the development of new business ideas either in start-up companies or as part of existing operations focusing on products and services that provide energy efficiency in housing, travel, work and leisure.

<http://sust.nu/English.aspx>

### **4.13.3 Funding Programmes**

#### **Demonstration Programmes for Electric Vehicles**

The Demonstration Programmes for Electric Vehicles started in May 2011 and will last for four years. It is funded by the Swedish Energy Agency with a total budget of 200 million SEK (25 million SEK in 2011, 50 million SEK annually in 2012 to 2014, and 25 million SEK in 2015).

The programme is aimed at identifying and possibly eliminating barriers for large-scale introduction of electric vehicles on the Swedish market. The practical test shall provide experiences with realistic vehicle performance and driver behaviour.

<http://www.energimyndigheten.se/.../Demonstrationsprogramme-for-elfordon> (Swedish)

#### **FFI - Strategic Vehicle Research and Innovation**

FFI is jointly funded by the Swedish government and automotive industry, and initially set to run from 2009-2012 with no definite ending year. The total annual budget is 100 million Euros, half of which is governmental funding. The programme promotes research, innovation and development with the focus on climate, environment and safety. The main goals are reducing the environmental impact of transport, reducing the number killed and injured in traffic, and strengthening international competitiveness. Currently there are five collaboration programmes: Vehicle Development, Transport Efficiency, Vehicle and Traffic Safety, Energy & Environment and Sustainable Production Technology.

<http://www.vinnova.se/en/FFI---Strategic-Vehicle-Research-and-Innovation/>

### **Energy Systems in Road Vehicles**

The Energy Systems in Road Vehicles programme entered its third phase in 2007 and ran until the end of 2010. It was administered by the Swedish Energy Agency and involved several research projects dealing with batteries, fuel cells, and other vehicle components that use electricity as a means of improving energy efficiency.

<http://energimyndigheten.se/sv/Forskning/Transportforskning1/.../Energisystem-i-vagfordon>

### **Energy-Efficient Road Vehicles**

The Energy Efficient Road Vehicles programme is the continuation of the **Energy Systems in Road Vehicles** programme and also run by Swedish Energy Agency. It was started in 2011 and will last until 2014. The aim of the programme is the unification of academic research in the field of road vehicles. It includes electric, hybrid, plug-in hybrid as well as other also fuel cell vehicles. The programme's financial resources are directed towards research and the focus must be technically innovative with a time horizon longer than ten years. The programme's research covers all the parts in a vehicle that is central to achieving higher energy efficiency.

<http://energimyndigheten.se/Forskning/Transportforskning1/Energieffektiva-vagfordon>

### **Swedish Hybrid Vehicle Centre (SHC)**

The aim is to establish an internationally competitive centre of excellence for HEV technology by facilitating education and research to meet industrial and societal needs in this area and by forming a natural framework for co-operation between industry and academia.

<http://hybridfordonscentrum.se/en>

## **4.14 United Kingdom**

### **4.14.1 Vision, Policies and Legislation**

Experts agree that the total decarbonization of transport will be an important step for the UK to reach their ambitious climate goals. The targets for 2020 have been set to cut transport emissions by 14% compared to 2008, to obtain 10% of UK transport energy from sustainable renewable sources, and to reduce CO<sub>2</sub> emissions of new cars to 95 g/km. The **Climate Change Act** passed in 2008 set longer-term goals of reducing greenhouse gas emissions by at least 80% compared to 1990 by 2050. Additionally five-year carbon budgets until 2022 were set. Of course, the promotion of ultra-low carbon technologies shall also create jobs in an industry sector that is expected to advance rapidly. Under the Climate Change Act a **Committee on Climate Change** (CCC) was established which announced the target for 2020 of 1.7 million electric vehicles on UK roads.

It is a longstanding goal of the UK to be a world leader in R&D, demonstration and finally commercialization of ultra-low carbon vehicles. Therefore, low-carbon vehicle technologies have been fostered in the UK early on. The Low Carbon Vehicle Partnership, an action and advisory group intended to take a lead in the UK's shift to low carbon vehicles, was established already in 2003. Following recommendation of the 2002 report of the Automotive Innovation and Growth Team (AIGT) a Centre of Excellence, the CENEX, was established in 2005. It is intended to integrate and bundle UK's plentiful but fragmented expertise and know-how regarding ultra-low carbon vehicle.

In April 2008 the **New Automotive Innovation and Growth Team (NAIGT)** was launched as an industry-led project facilitated by the Automotive Unit (AU) within the Department for Business, Enterprise and Regulatory Reform (BERR). NAIGT's objective was to negotiate a collective strategic view from the automotive industry on the challenges faced until 2025 in the areas Supply Chain Development, Technology and Low Carbon Product Development, Technology and Low Carbon Infrastructure, Business Environment, and Key Performance Indicators. In May 2009 a **NAIGT Report** on the future of the automotive industry in the UK was published including a technology roadmap.

In April 2009, the government announced the provision of different policy measures with a total budget of 400 million GBP for the promotion of shifting to ultra-low carbon vehicles in UK transport. In detail, The government invested 140 million GBP in the Technology Strategy Board's "Low Carbon Vehicle Innovation Platform", launched a 230 million GBP scheme to help incentivise car buyers make the low carbon shift, provided 30 million GBP for electric vehicle infrastructure, and supported the public sector with 20 million GBP to trial low carbon vans across the UK. The installed incentives for the acquisition of electric vehicles include exemption from the annual circulation tax and a five-year exemption from company car tax. Furthermore, electric vans receive a five-year exemption from the van benefit charge.

In order to stimulate the market for electric vehicles an **Electric Vehicle Delivery Plan for London** has been set up by the local government in 2009. The Delivery Plan covers the period until the year 2015 and includes the goals to have 25,000 charging points and 100,000 electric vehicles on the Capital's streets, as well as implementation tools like increased customer benefits, like a Congestion Charge discount.

As from 2011, purchasers of electric vehicles (including plug-in hybrids) will receive a discount of 25% of the vehicle's list price up to a maximum of 5,000 GBP. The government has set aside 230 million GBP for this incentive programme. The UK is also determinedly working on providing the required infrastructure. The strategy for the recharging infrastructure "**Making the Connection: the Plug-In Vehicle Infrastructure Strategy**" was published in June 2011.

The UK Government has set up a comprehensive policy suite regarding electric vehicles and infrastructures in order to create an advantageous environment in the early market stage.

- Government and Industrial investments: € 522.3 million
- Announcements concerning future EVs / PHEVs: 100,000 FEVs in 2015

### Links and References

Climate Change Act 2008

<http://www.legislation.gov.uk/ukpga/2008/27/contents>

Low Carbon Transport: A Greener Future – A Carbon Reduction Strategy for Transport

<http://www.official-documents.gov.uk/document/cm76/7682/7682.pdf>

Report: "Ultra low Carbon Vehicles in the UK"

<http://www.bis.gov.uk/files/file51017.pdf>

NAIGT Report: "An independent report on the future of the automotive industry in the UK"

<http://www.bis.gov.uk/files/file51139.pdf>

Government Response to the NAIGT Report

<http://www.berr.gov.uk/files/file53570.pdf>

An Electric Vehicle Delivery Plan for London

<http://www.london.gov.uk/archive/mayor/publications/2009/docs/electric-vehicles-plan.pdf>

Making the Connection: the Plug-In Vehicle Infrastructure Strategy

<http://www.dft.gov.uk/publications/plug-in-vehicle-infrastructure-strategy>

#### **4.14.2 Funding Organisations and Relevant Platforms**

##### **OLEV - Office for Low Emission Vehicles**

The OLEV has been established to manage the government programme for promotion of next-generation ultra-low emission vehicle technologies including the management of the regulatory framework that is driving emissions from road transport down. It receives staff and funding from the Department for Transport, the Department for Business, Innovation and Skills, and the Department for Energy and Climate Change.

<http://www.dft.gov.uk/topics/sustainable/olev/>

##### **Department for Transport (DfT)**

The department's objective is to create a transport system balanced for needs of economy, environment and society. It collaborates with regional, local and private sector partners. Concerning road transport, the department aims to tackle carbon and congestion issues and thus supports the early market for electric and other ultra-low emission vehicles.

<http://www.dft.gov.uk>

##### **Department for Business, Innovation and Skills (BIS)**

The Department aims to create the best conditions for private sector growth by investing in skills, reducing regulation to make markets more dynamic, and by promoting trade to boosting innovation and helping people start and grow a business. The BIS has an automotive unit comprising unique knowledge of the sector, materials, companies, technologies and the regulatory framework.

<http://www.bis.gov.uk>

##### **Technology Strategy Board (TSB)**

Accelerating economic growth by stimulating and supporting business-led innovation is the goal of the TSB, UK's national innovation agency. It manages programmes, invests in projects, provides information and knowledge, assesses opportunities, and helps to build networks. Transport, and specifically a sustainable transport system, is one of its focus areas. The research strategy includes the impact of growing demand for transport in terms of environment, energy use and efficiency.

<http://www.innovateuk.org>

##### **CENEX - Centre of Excellence for low carbon and fuel cell technologies**

Cenex, a government initiative supported by the Department of Business, Innovation and Skills (BIS), reports to a board of directors covering a broad cross-section of UK industry interested in low carbon and fuel cell technologies. The Centre of Excellence for low carbon and fuel cell technologies was installed after recommendations in the Automotive Innovation and Growth Team (AIGT) report of November 2002.

<http://www.cenex.co.uk>

##### **Low Carbon Vehicle Partnership (LowCVP)**

Low-carbon vehicle technologies have been fostered in the UK early on. The Low Carbon Vehicle Partnership, an action and advisory group intended to take a lead in the UK's shift to low carbon vehicles, was established already in 2003. Amongst others the aims of LowCVP are to accelerate a sustainable shift to low carbon vehicles and fuels in the UK and thereby stimulate opportunities for UK businesses.

<http://www.lowcvp.org.uk>

##### **The UK Automotive Council**

The Council, established in December 2009 after recommendation of the NAIGT report, provides a forum for discussions between the automotive industry and government and a long-term strategic framework for the sector's development. Its objectives are (i) the creation of a transformed business environment for the automotive industry in the UK in order to provide a more compelling investment

proposition for related industries, (ii) developing further the technology roadmaps for low carbon vehicles and fuels, and exploit opportunities to promote the UK as a strong candidate to develop these and other technologies, (iii) the development of a stronger and more competitive automotive supply chain, (iv) providing a stronger public voice for the industry to support the value of the industry to the UK and to global partners, and (v) to ensure a strategic, continuous conversation between Government and the automotive industry in the UK.

<http://www.automotivecouncil.co.uk>

### **The Low Carbon Vehicles Innovation Platform (LCVIP)**

The LCVIP launched in September 2007 in response to the NAIGT report. It aims to accelerate the adoption of ultra-low carbon vehicles in the UK and to maximize the benefit of the UK's industry from this shift. The two key tools of the platform are the Integrated Delivery Programme and the Ultra Low Carbon Vehicle Demonstrator.

<http://www.innovateuk.org/ourstrategy/innovationplatforms/lowcarbonvehicles.ashx>

#### **4.14.3 Funding Programmes**

##### **Ultra-Low Carbon Vehicle Demonstrator Project**

This demonstrator project is part of the LCVIP. Over 340 electric and plug-in-hybrid cars in eight locations around the UK are trialled collecting data on realistic performance and use of electric vehicles, driver behaviour and charging issues. So far over 25 million GBP have been invested.

<http://www.innovateuk.org/ourstrategy/innovationplatforms/lowcarbonvehicles/ultralowcarbonvehicledemonstrator.ashx>

##### **Low Carbon Vehicle Public Procurement Programme (LCVPPP)**

This Programme fosters the trial of over 200 electric and low emission vans from UK manufacturers in a range of public fleets. A budget of 20 million GBP is available.

<http://www.dft.gov.uk/topics/sustainable/olev/research-development/>

##### **Automotive Assistance Programme (AAP)**

The AAP existed from 2009 until the end of 2010 as a support package to the UK automotive sector. Loan guarantees in the amount of 2.3 billion GBP were provided. The AAP was aimed at automotive companies hit by the recession to enable them to making new investment into the development of green technologies, the advancement of R&D in vehicle manufacturing, and in job creation and sustaining.

<http://www.bis.gov.uk/policies/business-sectors/automotive/automotive-assistance-programme-guidance-summary>

##### **Alternative Fuels Infrastructure Grant Programme (AFIGP)**

The AFIGP is a programme from the Department of Transport supporting smaller infrastructure projects for all kinds of alternative fuels including electric.

<http://www.cenex.co.uk/programmes/igp>

##### **Plugged-In Places**

Within this scheme 30 million GBP are invested into the development of electric vehicle recharging infrastructure according to the government strategy "Making the Connection: The Plug-In Vehicle Infrastructure Strategy". The support is provided to local consortia of businesses and public sector partners by match-funding. In December 2010 the funding of 9 Plugged-in Places until 2013 was announced. Within the programme also data shall be collected from which the design of future national infrastructure can be evidenced. The programme is supervised by OLEV.

<http://www.dft.gov.uk/topics/sustainable/olev/recharging-electric-vehicles/>



### **Plug-In Car Grant**

This Plug-In Car Grant is intended to promote the early adoption of electric vehicles and Plug-In hybrids. Starting in 2011, the purchase of a qualifying ultra-low emission car will receive a grant of 25% towards the cost of the vehicle, up to a maximum of 5,000 GBP in order to make the whole-life cost of an electric vehicle more comparable to that of conventional cars. This grant is provided to private consumers and businesses. As of 30 June 2011, 680 cars had been ordered through the Plug-in Car Grant.

<http://www.dft.gov.uk/topics/sustainable/olev/plug-in-car-grant/>

### **Plug-In Van Grant**

After revision of the Plug-In Car Grant in 2011, a similar programme for vans has been announced in early 2012. The purchase of a qualifying ultra-low emission van will receive a grant of 20% towards the cost of the vehicle, up to a maximum of 8,000 GBP. This grant is provided to private consumers and businesses.

<http://www.dft.gov.uk/topics/sustainable/olev/plug-in-van-grant/>

### **Integrated Delivery Programme - IDP**

This investment programme, jointly funded by government and business with 200 million GBP, co-ordinates the UK's low carbon vehicle activity from initial strategic research through collaborative R&D leading to production. Currently the OLEV, the Department for Transport, the BIS, the Engineering and Physical Sciences Research Council (EPSRC), Advantage West Midlands, One North East and Invest Northern Ireland are investing in the programme which features:

- A strategic programme of university-based research targeted towards future technologies for which there are good prospects of commercialization in the long term
- An industry-led advisory panel that will help shape the technological direction and priorities for the programme. It is composed of representatives of leading elements of the UK automotive industry and low carbon vehicle technology developers, as well as relevant academic experts
- Flexible rolling opportunities for industry to seek support for high quality collaborative research and development proposals which take technology through to system or vehicle concept readiness
- Funding to support trialing and demonstration of particularly innovative lower carbon vehicle options.

So far the following competitions have been run:

1. *Disruptive technologies in low carbon vehicles*: The total budget is 9 million GBP. Up to 1 million GBP is aimed at feasibility studies and 8 million GBP are aimed at collaborative R&D projects. The call closed in April 2011. The call is managed by the Technology Strategy Board.
2. *Highly innovative strategic technologies in low carbon vehicles*: The total budget is 9 million GBP. Up to 1 million GBP is aimed at feasibility studies and 8 million GBP are aimed at collaborative R&D projects. The funded technology areas were (i) internal combustion engines, (ii) energy storage and energy management, (iii) lightweight vehicle and powertrain structures, and (iv) electric machines and power electronics.
3. *Low carbon vehicles integrated delivery programme strategic research portfolios*: This competition, being run by the Engineering and Physical Sciences Research Council (EPSRC), called for applications to attend a consortium building workshop, which explored research challenges in a number of technical areas supporting the development of low carbon vehicles (i) electric machines and power electronics, (ii) lightweight and powertrain structures, and (iii) hybrid power trains - control & optimisation. Up to 5 million GBP were available. The call closed in September 2010.
4. Integrated Delivery Programme Competition 4 made available 19 million GBP for innovative, industry-led collaborative research, development and demonstration in the field of low and ultra-low carbon vehicles. The competition closed in February 2010.

5. Aligned to the NAIGT roadmap and research agenda, the second competition aimed to accelerate research and development leading to the reduction of carbon emissions from mass market road vehicles. The dedicated budget amounts to 15 million GBP in two focus areas. The call closed in August 2009.
6. *Ultra-Efficient Systems for the Market Advancement of Electric and Hybrid Vehicles*: This call had a budget of 10 million GBP. It closed in February 2009.

<http://www.innovateuk.org/ourstrategy/innovationplatforms/lowcarbonvehicles/integrateddeliveryprogramme.ashx>

## 5 Non-European Countries

### 5.1 China

#### 5.1.1 Vision, Policies and Legislation

Although China already has one of the largest automotive industries in the world, one of its biggest shortcomings is its outdated combustion engine technology. Therefore, transitioning to large-scale electric-vehicle activity could give China the opportunity to achieve a competitive advantage. China began R&D for electric vehicle under the **National High-Tech Development Program „863 Program“**. The national 863 Program was introduced during the **10<sup>th</sup> Five-Year Plan** (2001-2005), where also the goal to commercialize and industrialize electric vehicles was introduced. This goal is refined in the **11<sup>th</sup> Five-Year Plan** (2006-2010). Therein, the Chinese government aims more specifically at becoming one of the leading producers of electric and hybrid vehicles and establishing an independent automotive industry. The goal meets two basic needs: to improve the environment and save energy at home, and to transform Chinese automakers into major players in the global automobile industry. The first need arises from the **Chinese Sustainable Development Strategy** (2009), wherein one of the main objectives is to reduce the CO<sub>2</sub> and pollutant emissions by 20% until 2020. Therefore the government has set an ambitious quantitative target to have five million electric cars on the road by 2020, and to have an annually production capacity of one million electric vehicles by 2020. A dedicated policy framework has been established within the last ten years in order to accelerate the development of electric vehicle technology, e.g. by large-scale state sponsored demonstration projects, supported by the National Development and Reform Committee (NDRC) and the Ministry of Science and Technology (MOST). After initially focusing on battery research, the attention has shifted recently to a strong emphasis on market introduction, in particular by government subsidies. The State-owned Assets Supervision and Administration Commission (SASAC) recently announced that China will invest more than 11 billion Euros over the next ten years in order to achieve the ambitious governmental goals. In the **12<sup>th</sup> Five-Year Plan** (2011-2015) the government intends to introduce a tax system reform for vehicles which supports the consumer. Also, the public procurement of e-vehicles will support the consumers indirectly by scaling-up production, which will result in cost benefits.

With the **Plan on Adjusting and Revitalizing the Auto Industry** the Chinese government has clearly demonstrated its strong direct and indirect support for the automotive industry. While in 2008 and 2009, nearly all automotive markets in the world were affected by a slow down following the world financial crisis, the Chinese passenger vehicle market grew by more than 40% in 2009, after a “moderate” growth rate of only 8% in the year before. Part of this growth was triggered by a consequent government incentive and subsidy policy.

The ten largest automotive companies formally targeted an electric-driven future in July 2009, when they established an “EV Industry Alliance” to work together to set EV standards, including standards of key vehicle parts (Chinese Association of Automobile Manufacturers, 2009). China and the US have signed a joint agreement on bilateral initiatives promoting electric mobility, including aspects of standardization. Having in mind the international competitive arena, the Chinese government recently announced that norms for electric mobility will be defined soon with the clear aim to be faster than European committees and institutions for standardization.

While electric vehicle development is a strategic focus in China, it is also a major focus of interest and development in other regions. Bilateral cooperation is an important driver for China as it seeks new technology, develops markets and ensures the development of a vehicle market that both meets and sets global standards. Aside from commercial collaboration, there are two major bilateral partners that China is cooperating with in the area of electric vehicles: the United States of America and Europe. International cooperation has been intensified lately. For instance, the “Electric Vehicles Initiative” (EVI) was launched in October 2010 at the Paris Motor Show (Salon mondial de l’automobile), by a

consortium including the International Energy Agency (IEA) and eight countries: China, France, Germany, Japan, South Africa, Spain, Sweden and the United States. The EVI will provide a platform for global cooperation on the development and deployment of electric vehicles. Participating countries have agreed to: (1) launch a pilot cities program to promote electric vehicles demonstrations in urban areas and share information on progress and outcomes; (2) increase information sharing on funding levels and other features of research and development programs; and (3) collect and share information on electric vehicle deployment targets and related.

Government-led industrial development has achieved considerable success in advancing domestic production of renewable energy and has ensured a strong and growing domestic market for clean technologies. Yet this same top-down approach has constrained the role of private companies, particularly foreign firms, in the market and has created obstacles to innovation that the state continuously tries to overcome.

In the **12th Five Year Plan** (2011–2015) China intends to deploy 2,351 charge and replacement power stations and 220,000 charge spots. The longer-term goal is to have 10 million charging stations by 2020. Further, China wants to put five million hybrids and electric vehicles on the road until the year 2020. In October 2010 China's science and technology minister Wan Gang announced the goal to have an annual production capacity of one million EVs in 2020.

## **Links and References**

China Sustainable Development Strategy (2009)

<http://www.world-governance.org/.../China Sustainable Development Strategy Report 2009.pdf>

Background paper: Electric Vehicles in the Context of Sustainable Development in China

[http://www.un.org/esa/dsd/resources/res\\_pdfs/csd-19/Background-Paper-9-China.pdf](http://www.un.org/esa/dsd/resources/res_pdfs/csd-19/Background-Paper-9-China.pdf)

National High-Tech R&D Program: Impact Investing - A Framework for Policy Design and Analysis

<http://www.rockefellerfoundation.org/news/publications/impact-investing-framework-policy>

Electric Mobility in China – A Policy Review (Fraunhofer ISI, 2012)

[http://isi.fraunhofer.de/.../discussionpaper\\_30\\_2012.pdf](http://isi.fraunhofer.de/.../discussionpaper_30_2012.pdf)

Electric Vehicle Initiative (EVI)

[http://www.cleanenergyministerial.org/our\\_work/electric\\_vehicles/index.html](http://www.cleanenergyministerial.org/our_work/electric_vehicles/index.html)

The 11<sup>th</sup> Five-Year Plan (2006-2010)

[http://english.gov.cn/special/115y\\_index.htm](http://english.gov.cn/special/115y_index.htm)

How China will get 5 Million Electric Cars on its Roads by 2020

<http://www.theclimategroup.org/our-news/news/2012/4/20/how-china-will-get-5-million-electric-cars-on-its-roads-by-2020/>

### **5.1.2 Funding Organisations and Relevant Platforms**

#### **Ministry of Science and Technology (MOST)**

The Ministry of Science and Technology (MOST) is the principal agency with responsibility for developing science and technology strategy, policy, and regulation, and for coordinating other government agencies and advisory bodies involved in implementation.

<http://www.most.gov.cn/eng/organization/Mission/index.htm>

### **National development and reform committee (NDRC)**

The NDRC is a successor to the State Planning Commission (SPC). Its principal functions are, amongst others, to formulate and implement macroeconomic policies as well as to formulate plans for the development of China's energy sector.

<http://en.ndrc.gov.cn/>

### **State-owned Enterprise Electrical Vehicle Industry Alliance (SEVIA)**

The Electric Vehicle Industry Alliance, which consists of 16 Chinese central state-owned enterprises (SOEs), is led by the **State-owned Assets Supervision and Administration Commission of the State Council (SASAC)**. It was founded in Beijing in August 2010. The alliance's short-term goal is to promote the unification of electric car-related technologies, and its medium and long-term goal is to master the core technology for electric vehicles and build internationally competitive Chinese electric car brands. The Alliance brings together the largest Chinese state-owned companies in the fields of automotive industry, battery industry, charging services, electrical industry, real estate development and production in a non-profit organization. SEVIA is intended to become a cooperation platform which companies can voluntarily join and which creates mutual benefit. The main tasks of the alliance are to implement the national development plans for electric vehicles, set respective standards and joint research. The members of SEVIA are planning to invest an equivalent of about 12 billion Euros in the development of electric cars and the supporting industry.

<http://sevia.sasac.gov.cn> (Chinese)

### **China Automotive Technology and Research Center (CATARC)**

The China Automotive Technology & Research Center (CATARC) was established in 1985 in response to the need of the state for the management of auto industry and upon the approval of the China National Science and Technology Commission. It is now affiliated to SASAC. As a technical administration body in the auto industry sector and a technical support organization to the governmental authorities, CATARC assists the government in activities such as standardization and formulation of technical regulations, product certification testing, quality system certification, industry planning and policy research, information service, as well as common technology research.

[http://www.catarc.ac.cn/ac\\_en/index.htm](http://www.catarc.ac.cn/ac_en/index.htm)

### **China Electric Vehicle Association (CEVA)**

The China Electric Vehicle Association, founded in 2004, is a national nongovernmental organization that is composed of representatives of the electric vehicle industry, public institutions and corresponding employees. The objectives of CEVA are (i) to focus on economic development; (ii) to make efforts to national economy progress and electric vehicle industry; (iii) to provide information to the government, members, enterprises or other sectors, and (iv) to act as a bridge between government and enterprises. The assignments of CEVA are (I) the Exploration of professional development strategies, (II) legal regulations and managerial systems, (III) the forwarding of related suggestions to the government and relevant leader agency, (IV) the promotion of horizontal cooperation between member units in order to accelerate win-win situations, (V) the exploration of professional theoretical and practical issues, (VI) the promotion of technical progress, (VII) the investigation of domestic electric vehicle technology and its marketing trend, (VIII) the compilation of business and technological information, (IX) the organization of training for electric vehicle talents, and (X) the organization of professional exhibition at home and abroad.

<http://www.ceva.org.cn/EN/>

### **Chinese Association of Automobile Manufacturers (CAAM)**

The national industry association CAAM deals with production and marketing activities regarding automobiles, motorcycles, car parts and related industries.

<http://www.caam.org.cn/english/>

### **Society of Automotive Engineers of China (SAE-China)**

The Society of Automotive Engineers of China (SAE-China) was founded in 1963. It is a national, academic body corporation and a non-profit-making social organization composed of Chinese automotive scientific & technical personnel and is a component part of the **China Association for Science & Technology (CAST)**. SAE-China's purpose is to promote the scientific and technical progress of the Chinese automotive industry, to foster the growth of automotive scientific and technical professionals, to promote the technical exchange between worldwide automotive circles, and to spread and popularize the automotive scientific and technical knowledge.

<http://www.sae-china.com/en/profile.htm>

<http://english.cast.org.cn/>

### **Clean Energy Research Center (CERC)**

The United States of America and China have created the US-China Clean Energy Research Center (CERC) which focuses on three areas: clean coal, "green" buildings, and clean vehicles. The clean vehicles component is led by the US Department of Energy and the Chinese Ministry of Science and Technology. Tsinghua University's State Laboratory on Automotive Safety and Energy leads the technical aspect of the project, with a large number of academic and corporate partners. Likewise, the US research partnership is led by the University of Michigan, with other research centres and vehicle manufacturers involved. The goal of CERC is to identify collaborative development opportunities between the US and China and build a long-term relationship in the fields mentioned before.

<http://www.us-china-cerc.org/>

Further organizations of more general more orientation however important for electric mobility are mentioned shortly in the following. The **Chinese Academy of Sciences (CAS)** presides over academic institutions and research organs and houses more than 125 state-controlled research institutes, which receive the majority of direct funding issued through the 863 Program. The **Natural Science Foundation Committee (NSFC)** is the advisory body responsible for allocating research funds to basic and applied projects. The **Chinese Academy of Engineering (CAE)** plays a key role in international collaboration and bridging the academic and industrial engineering communities.

<http://english.cas.cn/>

[http://www.nsf.gov.cn/e\\_nsf/desktop/zn/0101.htm](http://www.nsf.gov.cn/e_nsf/desktop/zn/0101.htm)

### **5.1.3 Funding Programmes**

Many companies and scientific research institutes are involved in government supported electric vehicle R&D efforts. According to the 12<sup>th</sup> Five-Year Plan, there will be 74 core projects, funded with an amount of about 92 million Euros. Unique to China is its focus on systematic demonstrations of electric vehicle technologies in a number of cities across the country.

#### **National High-Tech R&D Programme / "863 Program"**

The main objectives of the 863 Program are to fund technological research and innovation in areas of strategic importance to the nation's economic and social development. In recent years, priorities for 863 have included the development of key technologies in information infrastructure, biological, agricultural and pharmaceutical sectors, new materials and advanced manufacturing technologies, and environmental protection, resources, and energy development. The program has strongly

emphasized energy research in particular because of its strategic importance to national security, its implications for climate change, environmental sustainability, and public health. The 863 Program is engaged in the funding of electric vehicle related activities since the year 2001, when the “863 Electric-Drive Fuel Cell Vehicle Project” received an initial investment of RMB 800 million (approximately equivalent to 103 million Euros).

[http://www.most.gov.cn/eng/programmes1/200610/t20061009\\_36225.htm](http://www.most.gov.cn/eng/programmes1/200610/t20061009_36225.htm)

### **“Ten Cities, Thousand Vehicles” New Energy Vehicle Demonstration Project**

The “Ten Cities, Thousand Vehicles” project was found in 2008. After evaluation of the various implementation approaches in different places, successful demonstration pilots should be identified.

In early 2009, the Ministry of Finance, National Development and Reform Commission, the Ministry of Industry and Information Technology and the Ministry of Science and Technology listed Beijing, Shanghai, Chongqing, Changchun, Dalian, Hangzhou, Jinan, Wuhan, Shenzhen, Hefei, Changsha, Kunming, and Nanchang as the first 13 energy saving and new energy vehicle demonstration cities. In June 2010, seven more cities have been added: Tianjin, Haikou, Zhengzhou, Xiamen, Suzhou, Tangshan, and Guangzhou. In July 2011, the program was expanded to 25 cities, including Shenyang, Chengdu, Nantong, Xiangfan, and Hohhot. In these 25 cities, public service vehicles receive significant national government subsidies. Shanghai, Changchun, Shenzhen, Hangzhou, and Hefei are the first five pilot cities which offer subsidies of up to 7,000 Euros for private electric and other new energy vehicle purchases. Since 2009 more than 1 billion Euros have been invested.

### **National Basic Research Programme / “973 programme“**

The National Basic Research Programme (also called 973 Program) was approved by the Chinese government in June 1997 and is organized and implemented by the Ministry of Science and Technology (MOST). The 973 Program is created on the basis of existing research activities and deployments made by the National Nature Science Foundation and major dedicated pre-studies, to organize and implement basic research to meet the nation's major strategic needs. The 963 Program complements the more applied 863 Program, particularly in the fields of new and renewable energy research.

## **5.2 Japan**

### **5.2.1 Vision, Policies and Legislation**

The Japanese government has defined many targets associated to their vision of reducing CO<sub>2</sub> emissions, in particular from transport. In 2008, Japan devised the **Low Carbon Technology Plan** and set a long-term goal of reducing its then current level of emissions by 60 to 80% until 2050. In addition, the Japanese Prime Minister has announced plans to reduce the country's domestic CO<sub>2</sub> emissions by 25% until 2020 compared to 1990 levels. The Japanese government is also supporting the shift to low CO<sub>2</sub> vehicles and the development of fuel cell and energy storage technologies. Within a few years Japan became the leading nation for hybrid and electric vehicle production. The Ministry of Economy, Trade and Industry (METI) announced that it is the goal of the Japanese government to push the green innovation and amongst others to increase the fraction of electric vehicles regarding the new car registration. The development was actively promoted by a strong package of government incentives, like tax suspensions and subsidies for car replacements. Subsidies of electric car sales have been established right from the beginning. Japan started the first incentive programme in 1996 which was integrated in 1998 with the **Clean Energy Vehicles Introduction Project**. The project provided subsidies of up to 50% of the additional costs and ended in 2003 after an extension phase. Lately, the **Green Vehicle Purchase Promotion Measures** established tax deductions for electric car purchases between spring 2009 and fall 2010. The consequence was a surge in consumer demands. Though, after the expiration of the various incentives in late 2010 the sales of Toyota Prius hybrid

electric vehicles fell dramatically. Shortly afterwards, in March 2011, parts of Japan were struck by the disastrous Tōhoku earthquake and a subsequent tsunami leading to a nuclear melt-down. Beside the human tragedy there were severe damages of the automotive production chain. Also the field of electric vehicles was affected, as for instance Hitachi had to stop the production of Li-ion batteries. It is still a priority topic to find solutions for the social, economic and energy supply related consequences that will engage expert groups of governmental and industrial representatives in the next years. As part of the national disaster relief plan the Japanese government announced the extension of tax reductions and subsidies until the year 2015. Regarding the national power grid, it is an idea that the batteries of electric vehicles may play a role as energy storage devices in order to stabilize the grid in regular operation. In 2011 the METI requested 17.5 billion Yen (about 160 million Euros) in order to subsidise the introduction of clean-energy vehicles. The aim is to reach a fraction of 15 to 20% of new car registrations by the year 2020 which should increase to 20 to 30% until 2030. To accelerate the further commercialization of next generation electric vehicles, Japan has developed roadmaps in six areas: overall, batteries, natural resources, infrastructure, system integration, and international standards. Recently, the Japan Smart Community Alliance (JSCA) was established, which brings together over 250 member companies to coordinate smart grid and advanced transportation demonstrations in four focus regions, and acts as an umbrella programme for many of Japan's electric mobility demonstration projects. Japan aims to have 5,000 quick chargers and two million normal chargers by 2020, and also boasts a demonstration project for electric vehicles similar to German's national electric mobility programme. Lately, the New Energy & Industrial Technology Development Organisation (NEDO) devised **Battery RM2010**, a dedicated roadmap for the development of Li-ion battery R&D, published May 2010. The development of lithium-ion batteries has the highest R&D budget compared to other countries. Further, R&D activities are promoted by the tax system.

### Links and References

Low Carbon Technology Plan

[http://www8.cao.go.jp/cstp/english/doc/low\\_carbon\\_tec\\_plan/low\\_carbon\\_tech\\_plan.pdf](http://www8.cao.go.jp/cstp/english/doc/low_carbon_tec_plan/low_carbon_tech_plan.pdf)

Fact Sheet: Japanese Government Incentives for the Purchase of Environmentally friendly Vehicles

<http://jama.org/pdf/FactSheet10-2009-09-24.pdf>

Workshop Report: Governmental Programs on E-Mobility (page 8)

[http://iphe.net/events/workshops/workshop\\_2010-06.html](http://iphe.net/events/workshops/workshop_2010-06.html)

100 Actions to Launch Japan's New Growth Strategy

<http://www.meti.go.jp/english/aboutmeti/policy/2011policies.pdf>

Battery Technology Development Roadmap: Battery RM2010

<http://www.meti.go.jp/report/downloadfiles/g100519a05j.pdf> (Japanese)

### 5.2.2 Funding Organisations and Relevant Platforms

#### Ministry of Economy, Trade & Industry (METI)

The METI arranges most of the R&D funding in Japan. The R&D funding is administrated by the **New Energy & Industrial Technology Development Organisation (NEDO)**. NEDO is Japan's largest public management organization promoting research and development as well as deployment of industrial, energy and environmental technologies.

<http://www.meti.go.jp/english/index.html>

<http://www.nedo.go.jp/english/index.html>

#### National Institute for Materials Science (NIMS)

The National Institute for Materials Science is Japan's sole Independent Administrative Institution (IAI) specializing in materials science. NIMS engages in basic research and development of material



science, and in the advancement of the level of expertise in the field. Strong emphasis is placed on material research with respect to "Green Innovation" which is a main pillar of the Japanese growth strategy in its 4th Science and Technology Basic Plan (2011-2015).

[www.nims.go.jp/eng/index.html](http://www.nims.go.jp/eng/index.html)

#### **Japan Science and Technology Agency (JST)**

The Japan Science and Technology Agency promotes science and technology based innovations which will create new values by policy recommendation. Further, technology transfer is encouraged through the development of networks between academia and industry. The JST also hosts the **Center for Low Carbon Society Strategy (LCS)** where the reduction of transportation related emissions by electrification is a major topic.

<http://www.jst.go.jp/EN/>

<http://www.jst-lcs.jp/en/>

#### **Council for Science and Technology Policy (CSTP)**

The Council for Science and Technology Policy was established in the year 1999. CSTP is to oversee science and technology policies in Japan as well as to plan and coordinate comprehensive and basic policies on science and technology, including green innovations and electric mobility.

<http://www8.cao.go.jp/cstp/english/index.html>

#### **Organisation for the Promotion of Low Emission Vehicles (LEVO)**

The Organisation for the Promotion of Low Emission Vehicles (LEVO) has three major objectives: (i) the realization of environmentally friendly automobile society, (ii) the establishment of a sustainable transport system, and (iii) the promotion of new energy sources in transport which contribute to the preservation of nature.

<http://www.levo.or.jp/eng/index.html>

#### **Japan Automobile Manufacturers Association (JAMA)**

Established in 1967, the Japan Automobile Manufacturers Association is a non-profit industry association currently comprised of fourteen manufacturers of passenger cars, trucks, buses and motorcycles in Japan. JAMA works to support the sound development of Japan's automobile industry. The activities range from the preparation of studies and surveys related to automobile production, distribution, trade and use to the establishment and promotion of policies related to automobile trade and international exchange.

<http://jama.org/>

#### **Japan Smart Community Alliance (JSCA)**

The New Energy and Industrial Technology Development Organization (NEDO) established the Japan Smart Community Alliance (JSCA) to strengthen collaboration among a wide range of concerned organizations and also conduct activities of mutual interest, such as dissemination of information and preparation of roadmaps to achieve global standardization. JSCA has members from the electric power, gas, automobile, information and communications, electric machinery, construction and is engaged in the development of strategies, roadmap processes, and standardization regarding important technologies.

<https://www.smart-japan.org/>

#### **Japan Automobile Research Institute (JARI)**

The Japan Automobile Research Institute engages in activities to develop the automobile industry and to advance automobile technology in Japan by performing neutral and public-benefit activities as a test-and-research organization and a public-service corporation. The **Association of Electronic**

**Technology for Automobile Traffic & Driving (JSK)** and the **Japan Electric Vehicle Association (JEVA)** were integrated with JARI in 2003. JSK promoted the expansion of ICT concepts and fundamental technologies and provided an important platform for the ICT community, promoting also international cooperation. JEVA promoted the use of low-emission vehicles through research and development related to low-emission vehicles, in particular electric vehicles, thereby contributing to the improvement of the environment, to the proper use of energy resources, to the steady development of industry and economy, and to the improvement of the life of the people.

<http://www.jari.or.jp/english/>

### **5.2.3 Funding Programmes**

#### **Cool Earth – Innovative Energy Technology Programme**

In 2007, the ‘Cool Earth – Innovative Energy Technology Programme’ was announced. In this programme, the Japanese government supports the introduction of plug-in hybrids, electric cars and fuel cell vehicles. One of the programme’s aims is to reduce the cost of these vehicles down to 400,000 yen per kilowatt and increasing the durability up to 90,000 hours. The programme also intends to establish fuel cell technology in transport by 2020 to 2030.

<http://www.meti.go.jp/english/newtopics/data/pdf/031320CoolEarth.pdf>

#### **Green Vehicle Purchasing Promotion Measures**

From spring 2009 to fall 2010 the purchase of electric or fuel efficient vehicles was subsidized by the “Green Vehicle Purchasing Promotion Measures” incentive program. The reduction of greenhouse gas emissions was a key motivation for this programme. The replacement of older and fuel inefficient vehicles was particularly promoted by higher grants. The Government of Japan has allocated approximately 370 billion Yen (approximately 3 billion Euros) for the program, which could lead to the sale of up to 690,000 vehicles.

<http://jama.org/pdf/FactSheet10-2009-09-24.pdf>

#### **Lithium Ion and Excellent Advanced Batteries Development (Li-EAD)**

The intention of the Li-EAD programme is to research and develop high performance battery systems for next generation electric vehicles. The investment is as high as 2.48 billion yen, corresponding to approximately 26 million Euros, in 2011. It proposed completely new requirements on lithium-ion battery’s material technologies, battery system and battery performance assessment system. The development targets of 2015 set in Li-EAD are: the energy density of battery pack must reach 100 Wh/kg, the power density would be 2,000 W/kg, and by 2020, the energy density of battery materials would reach 200 Wh/kg, the power density would reach 2,500W/kg. And as for the relevant targets of next generation of lithium power battery, the energy density of positive material begins from 500 Wh/kg and must reach 700 Wh/kg by 2030.

<http://www.realli.org/newsdetail.php?id=183>

<http://www.itschina.org/UserFiles/2011-9/22/2011922155650100.pdf>

#### **Research and Development Initiative for Scientific Innovation of New Generation Batteries (RISING Battery Project)**

The RISING Battery Project was formed at the Kyoto University in 2009 with support of NEDO. The project targets comprise the development of technology to realize innovative batteries with superior performance as compared to lithium-ion batteries, the establishment of novel analytical methods to understand and improve lithium-ion batteries, and the formation of a dedicated interdisciplinary community for battery development. Amongst others, the RISING Battery Project outlines the path how to reach the ambitious target of 500 Wh/kg commercially available in 2030. The programme with its annual funding of 33 million USD will last until 2015.

[http://www.rising.saci.kyoto-u.ac.jp/pdf/RISING\\_Battery\\_Project\\_en.pdf](http://www.rising.saci.kyoto-u.ac.jp/pdf/RISING_Battery_Project_en.pdf)

## **Nano Technology Innovation Programme**

Japan's "Nanotechnology Network" is a program sponsored by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). For five years starting from year 2007, academic, business, and governmental nanotechnology researchers will have the opportunity to use facilities and equipment at 13 network sites with cutting edge nanotechnology. The aim of this program is to generate research results that will lead to innovations, e.g. establishing high performance electrode for automotive fuel cell.

## **5.3 South Korea**

### **5.3.1 Vision, Policies and Legislation**

In October 2009 the **Framework Act on Low Carbon, Green Growth** was enacted. The law enforces the South Korea to spend 2% of its annual gross domestic product in developing eco-friendly businesses and projects that will lead to both economic growth and reduction in greenhouse gas emissions simultaneously. South Korea announced that it will voluntarily reduce greenhouse gas emissions by 20% from the projected emission level in 2020 compared to 2005.

A dedicated **National Strategy for Green Growth** is to implement the national vision of green growth more effectively. The National Strategy is a mid- to long-term (2009 to 2050) national agenda which is to be implemented through the collaborative efforts between various governmental organizations, industries and civil society. The National Strategy is divided into ten specific policy directions. In this context, South Korea has developed ambitious plans that include quantitative targets for the future development of electric vehicles. The green vehicles penetration should reach 50% in 2050 and reduce CO<sub>2</sub> emissions by 50%. It is also a stated goal of the government to become the world's 4<sup>th</sup> largest green car producing country by 2013 and to enter the ranks of the world's top 4 auto makers by 2018. In order to put into action the agendas set out in the National Strategy in a systemic and consistent manner, the Korean government revived the practice of the five-year plans, which had been very effective during preceding development periods of the Korean economy. The first **Five-Year Plan for Green Growth**, covering 2009 through 2013, is manifesting the political commitments as well as a blueprint for government actions, containing specific budget earmarks and detailed tasks assigned to line ministries and local governing entities. In order to achieve the goals, the Korean government is strengthening its system for planning and prediction of technology developments for green transportation systems, and has formulated an R&D support policy, the **Government Support Plans for the Development of Green Vehicles**, with the aim of creating a consumer-centred technology development system. In December 2010 specific targets have been published. These targets include the build-up of an annual production capacity of 1.2 million green cars (electric and clean diesel vehicles) until 2015. The government aims to replace up to 10% of the nation's small-sized passenger cars with electric vehicles by 2015. Therefore, further investments of 2.2 billion Euros in the domestic car industry are planned for the period from 2011 until 2015. This is about double the amount compared to the previous five year period from 2006 until 2010, where 900 million Euros were spent to foster green mobility. The government is seeking the start of mass production in 2012. Further, the government announced an **Electric Vehicle Promotion Plan** that includes the supply of one million electric vehicles and 2.2 million charging points by 2020. The Korean government is also planning to invest a total of 111 million Euros until 2020, in order to establish a complementary charging infrastructure. Through smart grid projects, slow charger (3.3kW, 7.7kW) and rapid charger (50kW) have been developed. In order to speed up electric vehicle penetration and core components development the offered subsidies to public organizations when purchasing electric vehicles has been increased from about 2,100 Euros to up to 13,500 Euros, which corresponds to around 50% of

conventional gasoline vehicles' price. For public organizations a purchase quota for electric vehicles has been set up which gradually increases from 20% in 2011, 30% in 2011, and 50% in 2013. Other supports such as tax reduction, free parking, and bonus systems based on greenhouse gas emission level are also considered. Dedicated traffic lanes for short-distance neighbourhood electric vehicles have already been realized. In order to encourage development of core components, the government plans to provide tax reduction up to 20% on new growth engine components and 25% on source technologies. Dedicated R&D investments of about 270 million Euros concentrate on high-performance batteries and other related systems until 2014.

## Links and References

Framework Act on Low Carbon, Green Growth

[http://eng.me.go.kr/board.do?method=view&docSeq=8744&bbsCode=law\\_law\\_law](http://eng.me.go.kr/board.do?method=view&docSeq=8744&bbsCode=law_law_law)  
<http://eng.me.go.kr/file.do?method=fileDownloader&attachSeq=2129>

National Strategy for Green Growth

[http://eng.me.go.kr/content.do?method=moveContent&menuCode=pol\\_gre&categoryCode=00](http://eng.me.go.kr/content.do?method=moveContent&menuCode=pol_gre&categoryCode=00)  
<http://www.greengrowth.go.kr/english/>

Five Year Plan for Green Growth

[http://eng.me.go.kr/content.do?method=moveContent&menuCode=pol\\_gre\\_strategies](http://eng.me.go.kr/content.do?method=moveContent&menuCode=pol_gre_strategies)

Overview of the Republic of Korea's National Strategy for the Green Growth

[http://www.unep.org/PDF/PressReleases/201004\\_unep\\_national\\_strategy.pdf](http://www.unep.org/PDF/PressReleases/201004_unep_national_strategy.pdf)

Korea's Green Growth Strategy

<http://www.oecd-ilibrary.org/.../5kmbhk4gh1ns.pdf>

IEAHEV – Hybrid and Electric Vehicles (2011) – South Korea (pages 365 to 367)

[http://www.ieahev.org/assets/1/7/IA-HEV\\_2010\\_annual\\_report\\_6MB.pdf](http://www.ieahev.org/assets/1/7/IA-HEV_2010_annual_report_6MB.pdf)

### 5.3.2 Funding Organisations and Relevant Platforms

#### Ministry of Knowledge Economy (MKE)

The Ministry of Knowledge Economy, who is in charge of expansion of electric vehicle supplies, launched the "Green Car Forum" in association with electric vehicle experts from government, academia, and business sectors in order to establish detailed strategies for the development and commercialization of green cars.

<http://www.mke.go.kr/language/eng/>

#### Presidential Committee on Green Growth (PCGG)

The Presidential Committee on Green Growth was born to spearhead Korea's green growth strategy in coordination with the **Ministry of Environment** and the **Ministry of Knowledge Economy**.

<http://www.greengrowth.go.kr/english/>

#### Korea Advanced Institute of Science and Technology (KAIST)

The Korea Advanced Institute of Science and Technology is one of the top-notch research platforms in South Korea. Amongst others an alternative powering solution for electric vehicles called **On Line Electric Vehicle (OLEV)** has been successfully developed where inductive power supply from cables underneath the road is used instead of batteries only or on-board power generators like fuel cells.

<http://www.kaist.edu/edu.html>

### **Green Car Korea**

The Green Car Korea is an annual international trade exhibition. It is the most important exhibition for the automotive industry regarding the Korean market. The exhibition covers vehicles, components, infrastructure, and service. Started in 2008 it has established a regular point for meetings and discussions related to electric mobility in South Korea.

<http://www.greencar.or.kr/eng/>

### **Seoul Initiative Network on Green Growth (SINGG)**

The Seoul Initiative, initiated by the Ministry of Environment at the fifth Ministerial Conference on Environment and Development (MCED) in Asia and the Pacific 2005 aims at addressing major policy issues for Green Growth highlighted in the Ministerial Declaration of MCED and the Regional Implementation Plan for Sustainable Development in Asia and the Pacific. The Seoul Initiative provides a regional cooperation framework for Green Growth, taking into account the economic, social, cultural and geographical features of the region. It also provides a framework for policy consultations, capacity-building and networking for the promotion of Green Growth at the regional level. The Seoul Initiative Network on Green Growth is, in principle, open to all members and associate members of UNESCAP (United Nations Economic and Social Commission for Asia and the Pacific) and relevant organizations. The main purpose of this initiative is to propose a model of sustainable growth based on Korea's past experience of compressed and accelerated economic growth, which brought significant damage on the nation's environment. The project to develop the concept of Green Growth was supported by many research institutes including the **Korea Environment Institute**, the **Korea Institute for Industrial Economics and Trade**, the **Korea Institute of Public Finance**, and scholars from the fields of economics and the environment.

<http://www.singg.org/main/main.asp>

### **5.3.3 Funding Programmes**

The Korean Government leads research and development activities in collaboration with industry, universities and research institutes. Priority projects are financed by the government budget and energy-related funds from the government and industry. Several ministries have launched funding programmes aiming at the accelerated development of green cars. Retrieval of detailed information turned out to be difficult. Indications have been found that the funding programmes have budget frames of at least 433 million Euros in total and will last until the year 2013.

<http://www.fullermoney.com/content/2009-11-03/ElectricCarsPluggedIn2.pdf> (page 33)

### **21st Century Frontier R&D Program**

The 21st Century Frontier R&D Program followed up the **HAN Project** (Highly Advanced National Project). The programme focuses on technologies that lead to the development of specific products, particularly high-tech products in which Korea has the potential to compete with the advanced countries by the early 21st century. Next-generation vehicles are considered to fit very well in this programme.

### **The National Research Laboratory**

The National Research Laboratory (NRL), launched in 1999, aims to explore and foster research centres of excellence, which will play a pivotal role in improving technological competitiveness. The government will annually fund each laboratory with 190,000 Euros for up to five years through in-process evaluation, with a special emphasis on strengthening core technology in its relevant fields.

Over 300 NRLs across the nation have already received funding, comprising 150 in academia, 90 in research institutes and 60 in industry.

## 5.4 United States of America

### 5.4.1 Vision, Policies and Legislation

A driving motivation for the development and implementation of electric mobility is the rate of high oil imports. Major disadvantages emerging from the high import rate are seen to be the economy's high vulnerability regarding an increasingly volatile oil price, and the ecologic impact. Bearing in mind that oil is a limited resource and that the political stability in some oil exporting regions is a serious concern, the U.S government seeks the substitution of oil in the energy and transport sectors, envisioning independence of foreign oil imports.

In the last years, the American Government repeatedly announced the plan to push the deployment of one million plug-in hybrid vehicles as well as electric vehicles until 2015. In 2009 financial support was provided by the **American Recovery and Reinvestment Act** and major funding resources have been channelled through the Recovery Act. In total 2.4 billion USD have been available to be spent for the build-up of vehicle and battery production capacities and for the implementation of the necessary charging infrastructure. Also in 2009, the **American Clean Energy and Security Act (ACES)** implemented extensive provisions for electric cars.

In 2011 President Obama called for putting one million electric vehicles on the road by 2015 which represents a key milestone toward reducing dependence on oil and ensuring that America is in a leading position in the growing electric vehicle manufacturing industry. Two further bills, the **Electric Drive Vehicle Deployment Act** and the **Promoting Electric Vehicles Act** were introduced in 2011, but have not yet been enacted.

In summary, the Electric Drive Vehicle Deployment Act of 2011 includes amongst others the following objectives:

The amount of 800 million USD will be competitively awarded to five different deployment communities around the country, with the objective of deploying 700,000 electric vehicles in those communities within six years. Furthermore, additional consumer incentives of at least 2,000 USD should be provided for the first 100,000 consumers purchasing electric vehicles in these communities. In general, tax credits which reduce the prices of electric vehicles by up to 7,500 USD as well as tax credits of the costs of purchase and installation of electric vehicle charging equipment for individuals (up to 2,000 USD) or businesses (up to 50,000 USD for multiple equipment purchases) will be extended. Additional incentives for research, development, deployment and manufacturing are provided for technologies that enable the widespread deployment of electric vehicles and charging infrastructure. In August 2011 the first-ever national fuel efficiency and greenhouse gas emission standards have been published that will become effective in 2014.

In March 2012 President Obama announced the 1 billion USD **National Community Deployment Challenge** to catalyse up to 10 to 15 model communities to invest in the necessary infrastructure, remove the regulatory barriers, and create the local incentives to support deployment of advanced vehicles at critical mass. Deployment communities would serve as real-world laboratories, leveraging limited federal resources to develop different models to deploy advanced vehicles at scale. It is also proposed to improve the current tax credit for electric vehicles from 7,500 USD, making it scalable up to 10,000 USD. The total spending on the tax credits is proposed to be 3.7 billion USD. Moreover, also launching the **EV Everywhere Challenge**, a clean energy grand challenge to make electric-powered vehicles as affordable and convenient as gasoline-powered vehicles for the average American family within a decade, will substantially promote the advancements in technology development and electric vehicle deployment.

Obama's financial year 2013 budget includes 650 million USD to support, through the Energy Department, advanced battery and vehicle technology developments, including the EV Everywhere

challenge. EV Everywhere will invest in breakthrough R&D for advanced batteries, electric drivetrain technologies, lightweight vehicle structures, and fast charging technology. The explicit goal for the year 2022 of this initiative is to enable companies in the United States to produce a 5-passenger affordable electric vehicle with a payback time of less than 5 years and sufficient range and fast-charging ability to enable average Americans everywhere to meet their daily transportation needs more conveniently and at lower cost.

### **Links and References**

American Recovery and Reinvestment Act

<http://www.recovery.gov/>

American Clean Energy and Security Act

<http://www.govtrack.us/congress/bills/111/hr2454>

One Million Electric Vehicles By 2015

[http://www1.eere.energy.gov/vehiclesandfuels/pdfs/1\\_million\\_electric\\_vehicles\\_rpt.pdf](http://www1.eere.energy.gov/vehiclesandfuels/pdfs/1_million_electric_vehicles_rpt.pdf)

Promoting Electric Vehicles Act of 2011

<http://www.govtrack.us/congress/bills/112/s948>

Electric Drive Vehicle Deployment Act of 2011

[www.govtrack.us/congress/bills/112/hr1685](http://www.govtrack.us/congress/bills/112/hr1685)

National Community Deployment Challenge

<http://www.whitehouse.gov/the-press-office/2012/03/07/fact-sheet-all-above-approach-american-energy>

EV-Everywhere Challenge

<http://energy.gov/articles/president-obama-launches-ev-everywhere-challenge-part-energy-department-s-clean-energy>

### **5.4.2 Funding Organisations and Relevant Platforms**

#### **Office of Energy Efficiency and Renewable Energy (EERE)**

The Office of Energy Efficiency and Renewable Energy (EERE) invests in clean energy technologies that strengthen the economy, protect the environment, and reduce dependence on foreign oil.

<http://www.eere.energy.gov/>

#### **Alternative Fuels and Advanced Vehicles Data Center (AFDC)**

The Alternative Motor Fuels Act of 1988 and the Clean Air Act Amendments of 1990, which encouraged the production and use of alternative fuel vehicles and the reduction of vehicle emissions, led to the creation of the Alternative Fuels and Advanced Vehicles Data Center in 1991. The AFDC's mission is to collect, analyze, and distribute data used to evaluate alternative fuels and vehicles. Further, the AFDC became and continues to be the clearinghouse for the resources of the Clean Cities Programme.

<http://www.afdc.energy.gov>

#### **Electric Drive Transportation Association (EDTA)**

The Electric Drive Transportation Association is an industry association dedicated to the promotion of electric cars, other electric vehicles and transportation technologies. EDTA works with policymakers and the public to advance electric drive transportation, a real alternative to oil dependence.

[www.electricdrive.org](http://www.electricdrive.org)

### **National Plug-in Vehicle Initiative (NPVI)**

The National Plug-in Vehicle Initiative is promoted by the **Electric Drive Transportation Association (EDTA)** comprising automakers, utilities, battery and component manufacturers, associations and government entities dedicated to realizing the potential of the electric drive industry. The NPVI assembled 200 industry professionals and advocates, representing 62 companies and organizations in a unique inter-industry collaboration to create GoElectricDrive.com.

<http://goelectricdrive.com/>

### **Project Get Ready**

The Project Get Ready cities are leading the transition to electric vehicles. By sharing best practices and lessons learned about integrating electric vehicles into their cities, Project Get Ready cities identify and actively work together to overcome the critical barriers to electric vehicle adoption. It provides a database of US and international plug-in readiness activities.

[http://www.rmi.org/project\\_get\\_ready](http://www.rmi.org/project_get_ready)

### **United States Council for Automotive Research (USCAR)**

The United States Council for Automotive Research (USCAR), the umbrella organization of DaimlerChrysler, Ford, and General Motors, was formed in 1992 to strengthen the technology base of the domestic auto industry through cooperative, pre-competitive research. USCAR is committed to vehicle electrification and related topics.

<http://www.uscar.org>

### **U.S. Advanced Battery Consortium (USABC)**

The USABC seeks to promote long-term R&D within the domestic electrochemical energy storage (EES) industry and to maintain a consortium that engages automobile manufacturers, EES manufacturers, the National Laboratories, universities, and other key stakeholders.

[http://www.uscar.org/guest/view\\_team.php?teams\\_id=12](http://www.uscar.org/guest/view_team.php?teams_id=12)

### **Center for Automotive Research (CAR)**

The Center for Automotive Research is an interdisciplinary research center in the Ohio State University College of Engineering. Amongst others, the CAR research focuses on advanced electric propulsion and energy storage systems for reduced fuel consumption and emissions as well as advanced engines and alternative fuels.

<http://car.eng.ohio-state.edu/>

### **Electrification Coalition (EC)**

The Electrification Coalition is a group of business leaders committed to promoting policies recommendations and actions that facilitate the deployment of electric vehicles on a mass scale. The members of the Electrification Coalition are leaders of companies representing the entire value chain of an electrified transportation system. The EC published an extensive electrification roadmap in November 2009 outlining a vision for a fully integrated electric drive network in the United States. The opportunities and challenges facing electrification of commercial and government fleets were addressed by a subsequent fleet electrification roadmap in November 2010.

<http://www.electrificationcoalition.org/>

## **5.4.3 Funding Programmes**

### **Vehicle Technologies Program (VTP)**

The Vehicle Technologies Program helps the industry to develop and deploy advanced transportation technologies that could achieve significant improvements in vehicle fuel efficiency and displace oil with



other fuels that ultimately can be domestically produced in a clean and cost-competitive manner. Programme activities include research, development, demonstration, testing, technology validation, technology transfer, and education. Some of the following funding programmes are derived from the Vehicle Technologies Program, e.g. U.S. DRIVE, the Clean Cities Programme, and the 21st Century Truck Partnership.

<http://www1.eere.energy.gov/vehiclesandfuels/about/index.html>

### **U.S. DRIVE (Driving Research and Innovation for Vehicle efficiency and Energy sustainability)**

U.S. DRIVE is a cooperative partnership with industry to accelerate the development of clean, advanced, energy-efficient technologies for cars and light trucks and the infrastructure needed to support their widespread use. Formerly known as the **FreedomCAR and Fuel Partnership**, U.S. DRIVE brings together experts from the Department Of Energy, the national laboratories, and industry partners to identify critical research and development needs, develop technical targets and strategic roadmaps, and evaluate research and development progress on a broad range of advanced vehicle and energy infrastructure technologies. U.S. DRIVE partners work together on an extensive portfolio of advanced automotive and energy infrastructure technologies, including batteries and electric-drive components, advanced combustion engines, lightweight materials, as well as fuel cells and hydrogen technologies. By facilitating frequent and detailed technical information exchange among Department Of Energy, the national laboratories, and industry partners, U.S. DRIVE will help to accelerate technical achievement as the nation's top experts identify R&D needs, explore solutions to technical problems, and evaluate R&D progress. It will also help the partners to avoid duplicating efforts in government and industry and ensure that publicly funded research delivers high-value results that help overcome key barriers to technology commercialization.

<http://www1.eere.energy.gov/vehiclesandfuels/about/partnerships/usdrive.html>

### **Clean Cities Programme**

In 1992, the enactment of the Energy Policy Act of 1992 (EPAAct) required certain vehicle fleets to acquire alternative fuel vehicles. Subsequently, the Department Of Energy created Clean Cities in 1993 to provide informational, technical, and financial resources to EPAAct-regulated fleets and voluntary adopters of alternative fuels and vehicles. In almost 90 coalitions, government agencies and private companies voluntarily come together under the umbrella of Clean Cities. The partnership helps all parties identify mutual interests and meet the objectives of reducing the use of imported oil, developing regional economic opportunities, and improving air quality.

<http://www1.eere.energy.gov/cleancities>

### **21st Century Truck Partnership**

In the 21st Century Truck Partnership specific technology goals are addressed in five critical areas that will reduce fuel usage and emissions while increasing heavy vehicle safety. The five areas are (i) engine systems, (ii) heavy-duty hybrids, (iii) parasitic losses, (iv) idle reduction, and (v) safety. The aim of the Partnership is to support research, development and demonstration that enable achieving these goals with commercially viable products and systems.

<http://www1.eere.energy.gov/vehiclesandfuels/about/partnerships/21centurytruck/index.html>

### **Fuel Cells Technologies Programme**

The Fuel Cell Technologies Program is a comprehensive portfolio of activities that address the full range of barriers facing the development and deployment of hydrogen and fuel cells. The Fuel Cell Technologies Program works in partnership with industry, academia, and national laboratories, guided by the National Hydrogen Energy Roadmap and Hydrogen Posture Plan.

<http://www1.eere.energy.gov/hydrogenandfuelcells/>

### **Intelligent Transport Systems (ITS)**

On December 8, 2009, the Department of Transportation released the Intelligent Transportation Systems (ITS) Strategic Research Plan for the period from 2010 until 2014. This plan defines the strategic direction for the Department's ITS research program for the next five years and is designed to achieve a vision of a national, multi-modal surface transportation system that features a connected transportation environment among vehicles, the infrastructure and passengers' portable devices. The research programme focuses on intelligent vehicles, intelligent infrastructure and the creation of an intelligent transportation system through integration with and between these two components. The Federal ITS programme supports the overall advancement of ITS through investments in major research initiatives, exploratory studies and a deployment support program. Increasingly, the Federal investments are directed at targets of opportunity, like major initiatives that have the potential for significant payoff in improving safety, mobility and productivity.

<http://www.its.dot.gov/>

### **Batteries for Advanced Transportation Technologies Program (BATT)**

The Batteries for Advanced Transportation Technologies (BATT) Program is the premier fundamental research program in the U.S. for developing high-performance, rechargeable batteries for electric vehicles and hybrid-electric vehicles. This program is supported by the **U.S. Department of Energy Office of Vehicle Technologies (OVT)** and is managed by the **Lawrence Berkeley National Laboratory (LBNL)** as part of its Carbon Cycle 2.0 initiative.

<http://batt.lbl.gov/>

### **Applied Battery Research Programme (APR)**

The Applied Battery Research Programme focuses on high-power battery development in support of the U.S. DRIVE goal of affordable cars and light trucks. Started in late 1998 as the **Advanced Technology Development (ATD) Programme**, Applied Battery Research focuses on removing barriers that prevent U.S. battery manufacturers from producing and marketing high-power batteries for hybrid electric vehicles. Major challenges are life time, abuse tolerance, and cost.

[http://www1.eere.energy.gov/vehiclesandfuels/technologies/energy\\_storage/applied\\_battery.html](http://www1.eere.energy.gov/vehiclesandfuels/technologies/energy_storage/applied_battery.html)

### **National Cooperative Freight Research Programme (NCFRP)**

The National Cooperative Freight Research Programme is an industry-driven, applied research programme that develops near-term, practical solutions to improve the efficiency, reliability, safety, and security of the nation's freight transportation system. NCFRP is managed by the Transportation Research Board (TRB) of the National Academies and sponsored by the Research and Innovative Technology Administration (RITA) of the U.S. Department of Transportation.

<http://www.rita.dot.gov/rdt/ncfrp.html>

### **Sustainable Mobility - Advanced Research Team (SMART@CAR)**

The Center for Automotive Research (CAR) at the Ohio State University has launched a program focused on plug-in hybrid electric vehicles (PHEV), electric vehicles and intelligent charging. Topics for research, development, and demonstration are determined by the consortium members on an on-going basis. Currently on-going projects include PHEV grid modelling, multiple vehicles charging, virtual PHEV fleet studies, residual life characterization of PHEV batteries for secondary grid storage applications, PHEV energy management, and PHEV battery aging studies.

<http://car.eng.ohio-state.edu/smartatcar>

### **Recovery Act Funding Opportunities**

In 2009 President Obama announced that the Department Of Energy is offering up to 2.4 billion USD in American Recovery and Reinvestment Act funds to support next-generation plug-in hybrid electric vehicles and their advanced battery components. The new awards cover 1.5 billion USD in grants to US-based manufacturers to produce batteries and their components and to expand battery recycling capacity, 500 million USD in grants to US-based manufacturers to produce electric drive components for vehicles, including electric motors, power electronics, and other drive train components, and 400 million USD in grants to purchase thousands of plug-in hybrid and all-electric vehicles for test demonstrations in several dozen locations, to deploy them and evaluate their performance, to install electric charging infrastructure, and to provide education and workforce training to support the transition to advanced electric transportation systems.

### **The EV Project**

The EV Project was officially launched on October 1, 2009 and was initially awarded a 99.8 million USD grant from the Department of Energy. In 2010 the EV Project was granted an additional 15 million USD by the Department of Energy. With partner matches, the total value of the EV Project is approximately 230 million USD. The EV Project collects and analyzes data to characterize vehicle use in diverse topographic and climatic conditions, evaluates the effectiveness of charge infrastructure, and conducts trials of various revenue systems for commercial and public charge infrastructures. The ultimate goal of the EV Project is to take the lessons learned from the deployment of the first thousands of EVs, and the charging infrastructure supporting them, to enable the streamlined deployment of the next generation of EVs to come. A fraction of the funding supports the installation of home charging units. In exchange for allowing the collection of vehicle and charge information, participants receive a Blink wall mount charger at no cost.

<http://www.theevproject.com>

## 6 Discussion and Conclusion

In general the calls of the European Green Cars Initiative cover a wide range of topics from energy storage and drive train technology to system integration, safety and grid and traffic system integration. These calls are aligned very closely to the recommendations of the European Roadmap Electrification of Road Transport which has been compiled within the three European technology platforms EPoSS, ERTRAC and SmartGrids that represent the industry in the European Green Cars Initiative.

However, looking at the call topics in chapter 3.3.1, it is notable that on the European level implementation focusses on energy storage, drive train technologies and system integration. Table 1 in section 3.3.1 additionally shows that on project level energy storage and system integration are more active topics. European funding further concentrates on demonstration and piloting e.g. in the Green Emotion project of the European Green Cars Initiative, in the CIP-ICT-PSP projects (see chapter 3.3.3) as well as in the TEN-T project Greening Transportation Infrastructure for Electric Vehicles<sup>6</sup>. Policies are addressed at the European level by the Electromobility<sup>+</sup> call (see chapter 3.3.2). In comparison, Table 2 below shows the number of national funding programmes in the member states that address specific topics. Although, for straight comparison, the budget spent for funding a certain topic or at least the number of funded projects has to be looked at, Table 2 gives indications that R&D on technologies for components and systems and for demonstration and piloting is a focus in the member states. R&D for energy storage systems and grid integration is also fairly strong.

All in all the following picture emerges: Because of the importance of the battery for electric mobility this topic is strong on the European and national level. Furthermore, it is tried to regain a strong position in battery know-how for development and production to lessen the dependence on Japan and China in this regard. System integration is stronger represented on the European level. A reason for this may be that electric mobility needs and develops new value chains which are easier to form on the European level. Technologies for drive train and other components and systems are dealt with in European programmes, but the national funding is also very strong.

This can be expected, since such research touches areas of the core competencies of the automotive stakeholders, especially in countries with OEMs. Hence, the industry keeps its R&D activities on the national level and also regional authorities are interested in keeping know-how for the local development of industry and job market. The same should be true for production technologies. The member states with automotive OEMs have some funding for R&D on production technologies, but as far as it is deducible from the information given in this report, specific funding programmes for production technologies are rare. Grid integration is a European topic especially when considering interoperability issues. Nevertheless, it is also quite a strong national concern, because the practical realization is needed foremost on the regional and local scale at least in the first phase.

It can be concluded that research fields that are strong on the European level are especially those that have strong ICT aspects. These are e.g. energy storage systems which need sophisticated battery management systems, or vehicle system integration that includes the ICT architecture of the electric vehicle, or drive train components that need intelligent power electronics.

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<sup>6</sup> [http://tentea.ec.europa.eu/en/ten-t\\_projects/ten-t\\_projects\\_by\\_country/multi\\_country/2010-eu-91117-p.htm](http://tentea.ec.europa.eu/en/ten-t_projects/ten-t_projects_by_country/multi_country/2010-eu-91117-p.htm)

	Energy Storage	Technology/Components and Systems	System Integration	Grid Integration / Renewable Energies	ITS + Integration in the Transport System	Production	Test	Market Development/Procurement	Demonstration/Pilot Activities
Austria	2	3		1				1	2
Denmark	1			3			1	1	2
Finland								1	1
France	2	3		1			1	1	1
Germany	3	5	3	2	2	3	5		4
Italy				1					
Netherlands							1	1	1
Poland		1		1	1				
Portugal		2			1				1
Spain		2		1				1	1
Sweden	2	3			1	1			1
United Kingdom		2		2		1		2	3
<i>Total</i>	<i>10</i>	<i>21</i>	<i>3</i>	<i>12</i>	<i>5</i>	<i>5</i>	<i>8</i>	<i>8</i>	<i>17</i>

**Table 2** Number of programmes addressing specified topics in each analysed European country. Programmes with different focusses are sorted in multiple rows.