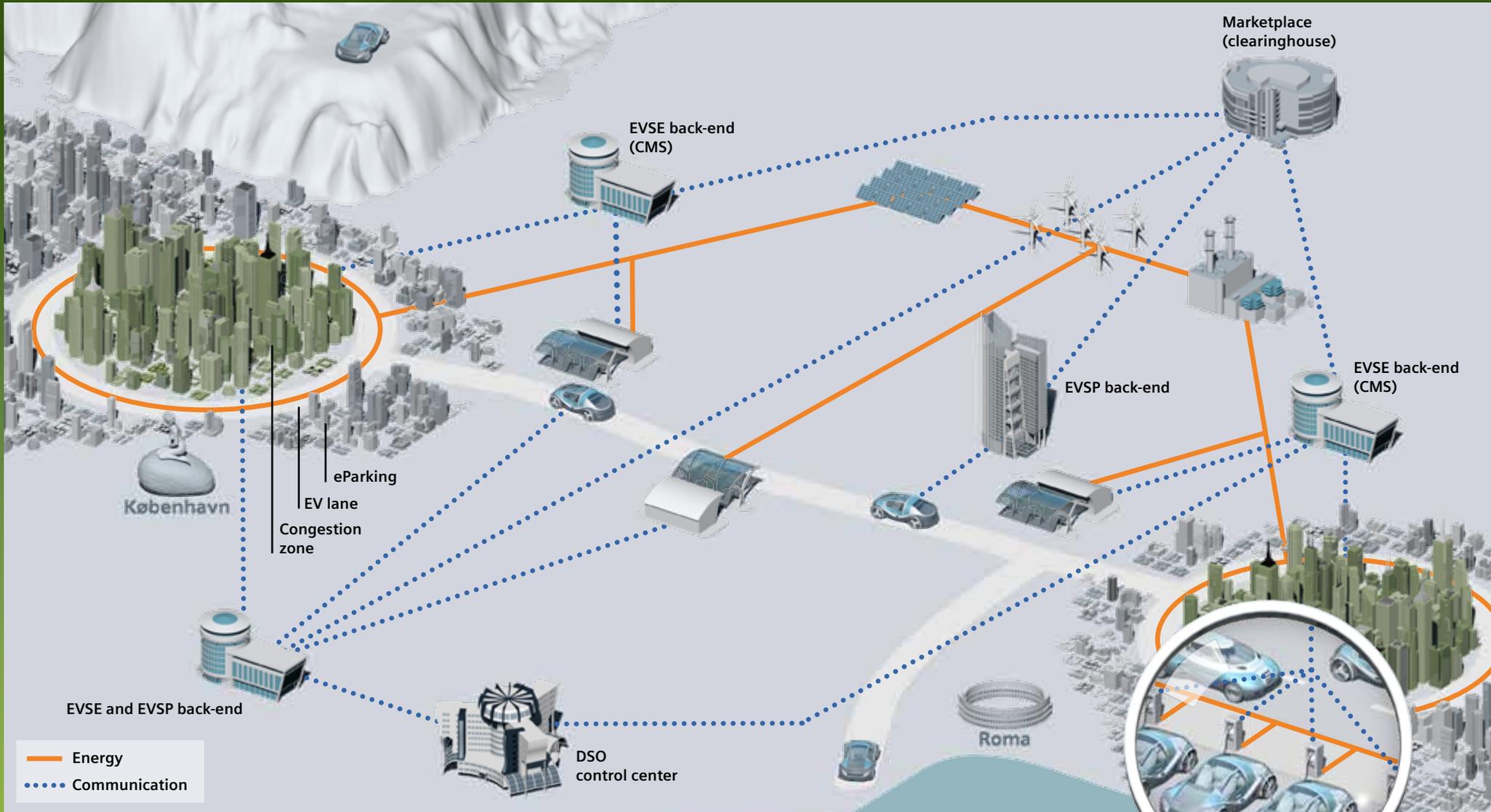




Green eMotion –

a pan-European effort towards an interoperable electromobility system

Green eMotion – developing the European framework for electromobility



EVSE Electric Vehicle Supply Equipment

EVSP Electric Vehicle Service Provider

DSO Distribution System Operator

CMS Charge Management System

The Green eMotion project builds on the results of numerous national and European electromobility projects and combines them into one international initiative. As a demonstration project, Green eMotion shows how electromobility can function across Europe, thus helping to prepare the mass market for electric vehicles.

Driving with electricity in the future

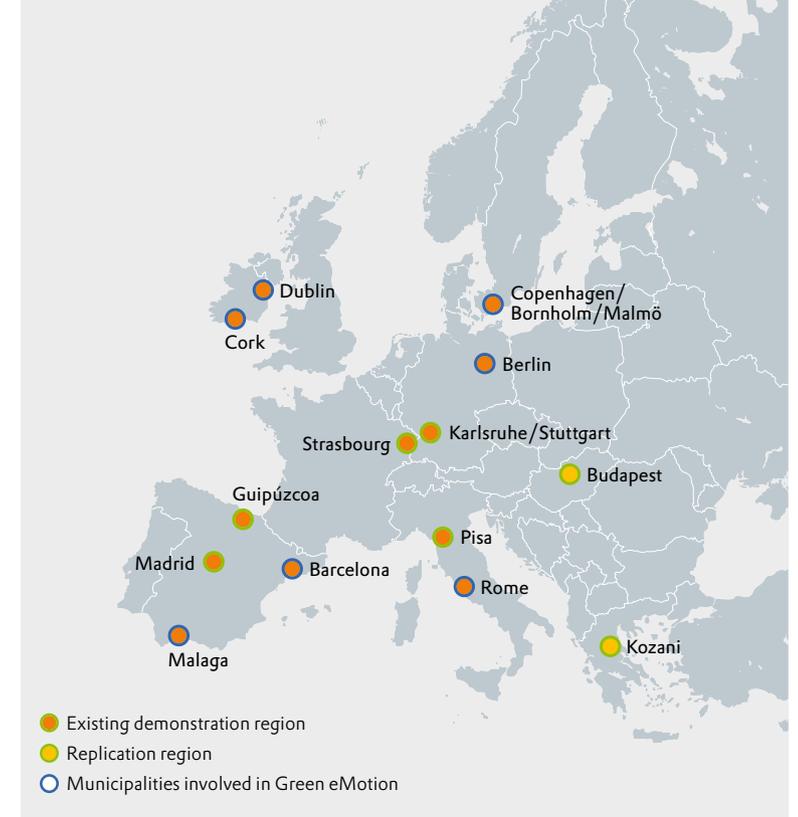
As a part of the European Green Car Initiative, the Green eMotion project plays a key role in achieving a significant reduction of CO₂-emissions in traffic by 2050. Forty-three partners from industry, universities, research institutions, power supply companies, and municipalities have come together for the purpose of identifying the challenges of Europe-wide emissions-free transportation. For a project duration of four years, Green eMotion is developing specific solution proposals, including setting up a European marketplace for electromobility and optimised infrastructure solutions for electricity supply networks and charging systems, as well as generating recommendations for standardisation.

Green eMotion follows a multidisciplinary approach, unifies ongoing regional and national electromobility initiatives and compiles results of earlier research projects on electromobility.

From these diverse elements, an interoperable system of uniform processes, standards, and IT solutions will be created by 2015 that will help to leverage electromobility throughout Europe by providing simple, seamless access to charging infrastructures and related services.

Green eMotion

- recommends selected standards for an interoperable electromobility system (de facto standards for Europe)
- defines the IT architecture for a European marketplace, including interfaces that allow for competition in implementation
- recommends approaches to an optimised grid and charging infrastructure
- tests and demonstrates the interoperability of an electromobility system in selected demo regions
- fine-tunes the proposals and results in discussion with a broad stakeholder base
- analyses the operability of electric cars under real-life conditions and develops recommendations for implementation in the mass market (to increase user acceptance)



In the Green eMotion demo regions roughly 2,000 EVs are being driven right now and more than 2,500 charging points are installed to supply electricity for them.

This will increase to around 70,000 EVs and more than 80,000 charging posts in 2015.

In total more than 380 Mio € are spent in funded projects within these demo regions (plus private investments by Green eMotion partners).



Demo region DE1 – Berlin

The utility company RWE and the city of Berlin are working closely together in this model region and examining the functionalities of a clearing house in the context of electric vehicle use – as in all the demo regions, this also involves partners outside the Green eMotion consortium. The clearing house is part of the marketplace for electromobility. It's the place where all communication by market participants comes together, where charging requests from all over Europe are processed, and where billing is initiated.

Key activities

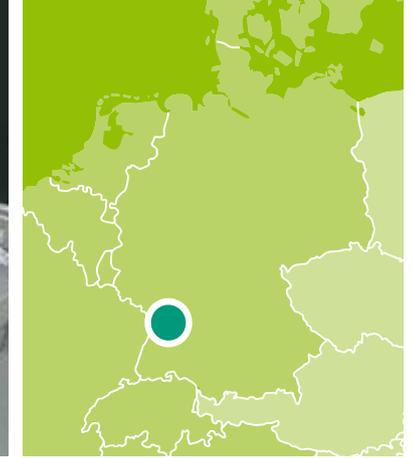
- Green eMotion will demonstrate the interoperable electromobility system by implementing a marketplace interface with clearing house functionality

Project highlights

- Number of eCars: approximately 200, including BMW Mini-e, Vito, Karabag 500, and Smart ed
- Infrastructure data: 243 public outlets (RWE) in Green eMotion data evaluation programme
- Additional 50 public outlets (Vattenfall) installed
- E-roaming in Berlin provided in partnership with another mobility company
- Close cooperation with automotive partners in standardisation
- With Berlin having been named one of the German "showcases" of electromobility, demo region Berlin will connect Green eMotion with key developments in electromobility throughout Germany

RWE
The energy to lead™

be_{min} Berlin



Demo region DE2 – Stuttgart/Karlsruhe

Key activities

- Analysis of concepts, experiences, and collected data
- Exchange of requirements, results, and experiences
- Demonstration of cross-border charging and other interoperability services on a European level
- Pan-European marketplace connectivity

The second German demo region is coordinated by Bosch. Together with the external stakeholder EnBW and in close relationship to the CROME research project, concepts for services in particular cross border electromobility between France and Germany are analysed and demonstrated between the regions Strasbourg and Karlsruhe.

Project highlights

- Aggregation of multiple projects in the Baden-Württemberg region (finished, active, and planned projects in the region; for example MeRegioMobil, NOW "Modellregion", Crome)
- Cross-border interoperability with demo region Strasbourg
- Available eCars: 40 in 2011 -> 100 in 2015
Available charging posts: 55 in 2011 -> 150 in 2015

**BOSCH**

Invented for life



Demo region DK/SW – Denmark and Sweden

Denmark and Sweden are using a cross-border model region to investigate how a typical scenario for a regional electromobility infrastructure might look. The two countries are examining a variety of charging systems (including battery switch), and how roaming can facilitate traffic between Denmark and Sweden.

Project highlights

- Evaluation of user behaviour, acceptance, and driving patterns
- At the end of 2011, there were approximately 800 EVs (electric vehicles) driving in this demo region, supplied by 843 CPs (charging points) and one battery switch station; approx. 20 battery switch stations by end of 2012, and by 2015 Denmark will have a nationwide network of charge spots and battery switch stations that enable thousands of EV drivers to drive across all of Denmark and into Sweden
- Within Green eMotion data from 65 EVs and 11 CPs are evaluated

Key activities

- Different types of charging solutions: Standard charging points as well as battery switch
- Roaming between Danish EV Service providers (e.g. Better Place and Choose EV) as well as between Denmark and Sweden
- Vision and strategies for electromobility
- Renewable energy as source for electromobility
- Bornholm has a collaboration project between Greenabout and GTA in in the U.S. for the NEV MyCar

better place 





Demo region ES1 – Barcelona and Malaga

Key activities

- Advanced charging management strategies will be demonstrated
- New smart grid functionalities and added services will be evaluated
- Optimised grid integration design of fast-charge station with storage system will be demonstrated
- Large e-bike demonstration site
- Important GeM dissemination activities to take place
- Specific marketplace services to be evaluated

The first Spanish model region demonstrates that electromobility isn't limited to passenger cars. Based on an initial sample of 250 vehicles, including 150 e-bikes, the team is analysing usage behaviour at what are mostly public charging stations. In the future, the team will also investigate new smart grid functions and value-added services.

Project highlights

- Number of EVs in 2011: 250 (150 e-bikes), of which 33 EVs have Green eMotion dataloggers
- 182 CPs included in the Green eMotion data evaluation programme
- Public charging infrastructure mainly in Barcelona and Malaga
- Charging infrastructure to be deployed in 2012 in Seville and Barcelona metropolitan area to be included in this demo region
- Ongoing interoperability development between infrastructures and cities





Green eMotion model region ES2 – Ataun/Madrid

The second Spanish model region includes the large inland city of Madrid and small town of Ataun (Guipúzcoa), where the team is testing various aspects of electric-vehicle car sharing, especially in relation to user recognition, reservations, and billing.

Project highlights

- Private car sharing for municipality residents
- Corporate car-sharing for Iberdrola employees
- Five EVs and five CPs (Ataun) and eight EVs and eight CPs (Madrid)
- 41 registered users (Ataun) and 116 registered users (Madrid)
- 12 EVs and 13 CPs included in the Green eMotion data evaluation programme

Key activities

- Photovoltaic power supply (CO₂-free power)
- Different authentication systems: using web page, RFID, and password
- User is charged based on usage time
- Additional funding from public-private regional collaboration
- Reservation via private web page
- Estimation of available range at reservation time





Green eMotion model region FR1 – Strasbourg

Key findings

- Users recharge mainly at work and at home
- If charging is not controlled, users charge in peak periods (8 am at work, 7 pm at home)
- On average, users recharge their PHEV once a day
- Little use of public charging stations:
 - Public charging stations must be easy to access
- Public charging locations must offer a logical intermodal traffic concept
- Public charging must be highly available or it will be ignored rather quickly

In Strasbourg, Green eMotion is investigating the charging behaviour of vehicle users. At 155 locations, participants are offered various options for charging a total of 70 plug-in hybrid vehicles. Preliminary results from earlier projects are already available, indicating that participants prefer to charge their vehicles during the general peak charging times if charging behaviour is not restricted. In addition, participants rarely used public charging terminals, unless the terminals were integrated into an intermodal traffic concept.

Project highlights

- 70 PHEV (Plug-in Hybrid Vehicles) in this demo region
- 33 partners involved
- Cross-border interoperability with demo region Stuttgart/Karlsruhe
- 71 EVs and 116 CPs included in the Green eMotion data evaluation programme





Green eMotion model region IE1 – Ireland

In addition to user trials and behavioural analysis and the properties of modern battery systems, Green eMotion in Ireland is primarily investigating options for sustainably integrating electric vehicles into the country's power supply network.

Project highlights

- 200+ ecars running supplied by 700+ smart CPs (June 2012)
- Installation of a nationwide charge point network virtually complete
- Cross border electric highway to Northern Ireland (U.K.)
- 15 EVs and 8 CPs included in the Green eMotion data evaluation programme



Key activities

- ESB ecars is developing a comprehensive network of charging points with open systems and platforms that will be accessible to all supply companies, while also promoting the use of electric mobility
 - Working with companies to develop related EV products and services (Intel, JTM, M2C)
 - E-taxi – ESB ecars and NRC Taxis launched Ireland's first electric taxi service in June 2011
 - Study of installation practices and electrical connection of charging infrastructure
 - Field testing of newer charging systems such as induction and more advanced fast charging
- Trinity College Dublin is currently doing research in the areas of battery range, how people use and charge electric vehicles, and their impact on the environment
- Codema is working to integrate electric vehicles within an overall sustainable energy plan for a green and energy-smart city
- Cork City is looking to promote the use of electric mobility in the city center for travel, deliveries, and in its own fleet; for example, by securing free parking for electric vehicles and seeking national legislation to reserve parking spaces



Green eMotion model region IT1 – Italy

Key activities

- Green eMotion is complemented by other Italian electromobility projects, such as e-Moving (A2A, Renault) and PRIME (financed by Italian Ministry of Environment)
- Ongoing interoperability development between automotive industry, regional/local institutions and DSOs
- Overview of publicly accessible charging stations via web portal

Besides fulfilling the requirements of a pan-European interoperability of infrastructure and services for electric mobility, Green eMotion in the Italian demo region is examining user behaviour and demonstrating value creation of EV integration into the electricity grid. From an initial fleet of 100 vehicles, in 2012 the number of vehicles in Green eMotion is expected to reach 150. At the same time, the charging infrastructure will also be expanded, initially in Rome, Milan, and Pisa.

Project highlights

- 111 eCars and 240 CPs in Green eMotion data evaluation program
- eCars and charging infrastructure mainly in Rome, Milan, and Pisa
- Further charging infrastructures to be deployed in Bologna, Reggio Emilia, Rimini, Bari, Genova, and Perugia in 2012
- The entire Italian infrastructure currently has 247 charging stations



Green eMotion renders electromobility operational



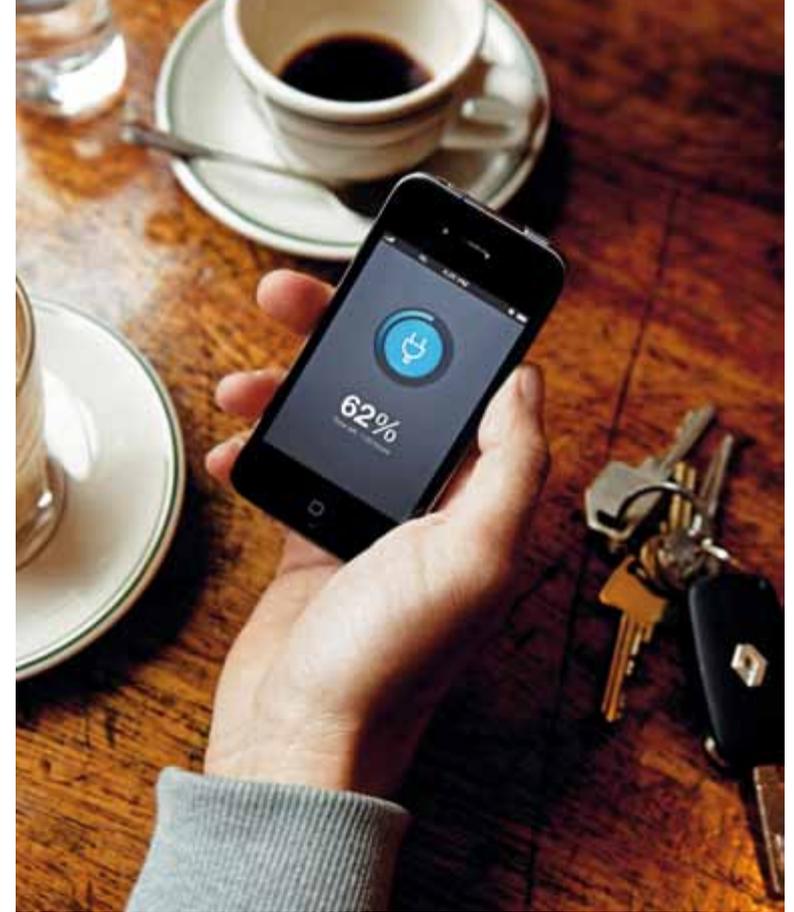
With the development of the virtual marketplace, and thanks to standards and recommendations for suitable infrastructures, Green eMotion has become the driving force behind the seamless introduction of electromobility in Europe.

Preparing the ground for interoperable electromobility

The Green eMotion project approaches the challenge of creating an interoperable system for Europe-wide emission-free transportation with a combined effort of 43 consortium partners – each of them contributing unique expert knowledge.

Green eMotion tackles the task of developing the framework for European electromobility by concentrating on five key aspects:

- Marketplace and related services
- Standards of excellence
- Optimised infrastructure solutions
- Proven technology for the advancement of mobility
- Interdisciplinary recommendations on policies and regulations





Green eMotion renders electromobility operational



Marketplace and related services

Green eMotion develops and demonstrates a virtual marketplace to enable Europe-wide electromobility and allow for new added-value transportation services that will increase EV user convenience. Field testing of transregional and cross-border solutions will begin in spring 2013. The project will conclude with specific recommendations for European-wide roaming in an interoperable system and presentations of new business models for added-value services.

- Local solutions
- Free charging or flat rate for registered users
- Some upcoming local roaming solutions

- Business analysis
- System architecture (04/12)
- Development (wip*)
- Implementation (04/13)
- Demonstration (from 04/13)

- Europe-wide roaming
- Interoperable system
- New business models with added-value services
- Increased user acceptance

Standards of excellence

Green eMotion contributes to the improvement and development of new and existing standards for electromobility, using the existing standardisation bodies for their implementation. In cooperation with Green eMotion partners and stakeholders, existing standards and needs will be analysed, and guidelines for the selection of standards will be set up to establish de-facto European standards. As a result, an open architecture for a comprehensive interoperable European electromobility system will be established, allowing for competition in the market and optimised user acceptance.

- Local solutions
- Different or missing standards e.g., plugs, communication protocols, unique identifier, payment

- Analysis of existing standards and needs
- Development of proposals (wip*)
- Harmonisation with stakeholders and standardisation committees (05/12, 04/14)
- Common methodology and field tests (07/12)
- Guidelines for the selection of standards (02/15)

- De facto standards for Europe accepted by a broad base of companies (partners and stakeholders)
- Open architecture for a complete European electromobility system allowing for competition in the market
- Interoperable system
- Increased user acceptance

* wip = work in progress



Optimised infrastructure solutions

An important part of Green eMotion's deliverables is to develop a set of requirements for networks and charging infrastructures for the implementation of successful electromobility systems. Therefore Green eMotion is taking a closer look at previous local pilot projects. After collecting and evaluating relevant data, a planning toolkit and guidelines for the deployment of interoperable charging equipment will be developed. Once different approaches have been tested, detailed expertise and recommendations on installing an optimal charging infrastructure will be available.

- Local pilot projects
- Many independent approaches leading to versatile, not compatible solutions
- Small product series with high costs
- No common knowledge base e.g., technology, charging network, grid interface

- Data collection and evaluation (wip*)
- Development for a planning toolkit (10/13)
- Guidelines for infrastructure deployment (04/14)
- Demonstration of different types of charging solutions (10/13 – 04/14)
- Implementation of charging management solutions for optimised integration of EVs in local grids (10/13)

- Recommendation on optimal charging infrastructure regarding type, number, location, and user acceptance
- Recommendation on charging infrastructure with minimised grid enhancement costs

Proven technology for the advancement of mobility

Green eMotion validates the performance of EV technology in terms of durability, costs, and safety aspects under real-world driving conditions in different climate zones. The ultimate goal is a uniform Europe-wide system that can overcome all the challenges of weather and climatic conditions, as well as differing usage patterns. A significant result of Green eMotion will be specific comparative figures from manufacturer data relating to vehicle performance and environmental performance, as well as recommendations for safety training and maintenance tasks.

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Interdisciplinary proposal on policies and regulations

Green eMotion ensures that the electromobility system will be understood from a multi-criteria perspective with respect to technical, economic, environmental, and social aspects. Green eMotion identifies hurdles and barriers as well as best practices in the demo regions. In addition, field test results based on real data about costs, barriers, and user acceptance will be evaluated as well as the environmental impact of intermodal transportation concepts.

- Local policies and regulations (municipalities, countries)
- Limited experience on effectiveness of measures
- Limited experience on acceptance of concepts

- Data collection and evaluation (wip*)
- Identification of hurdles and barriers (social, technical, environmental, legal, economic) (04/13)
- Evaluation of field test results based on real data about costs, barriers, user acceptance, potentialities (05/13)
- Evaluation of the environmental impact of intermodal transportation concepts (10/14)
- Increase user acceptance through extensive dissemination activities during the project (wip*)

- Report describing key features of successful implementation of electromobility
- Recommendations for the mass market roll out of EVs in the EU based on the analysis of user acceptance, environmental impact, and technology



The project partners of Green eMotion

For more information please contact:

E-mail: info@greenemotion-project.eu
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