Electromobility+

Transnational Projects

Imprint

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TÜV Rheinland Consulting GmbH
Research Management
Am Grauen Stein
D-51105 Köln
Phone +49 221 806 4142
Fax +49 221 806 3496
www.tuvpt.de

Design and Production

TÜV Rheinland Consulting GmbH
Research Management
Susanne Schmitz
susanne.schmitz@de.tuv.com

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For further information on the Electromobility+ project please contact

TÜV Rheinland Consulting GmbH
Research Management
Oliver Althoff (Coordinator)
Am Grauen Stein
D-51105 Köln
Phone +49 221 806 4142
Fax +49 221 806 3496
www.tuv.com

For more information visit www.electromobility-plus.eu

Introduction

Electromobility+

Boosting the roll-out of electromobility in Europe

Background

Increasing awareness on climate change, the scale of the challenges involved, and the pressing need to prepare for a post-petrol future have prompted most of the world's developed countries to step up the research, trialling and deployment of transport systems that use more energy-efficient and less petrol fuel-dependent vehicles. In response to the second objective on petrol dependency, electric power offers a potentially groundbreaking solution, provided that the production supply chain does not emit too much CO2.

Transnational call Electromobility+

Within the frame of Electromobility+ ministries and funding agencies of 11 European countries and regions have joined for funding transnational research projects. The countries / regions involved are: France, Germany, The Netherlands, Austria, Finland, Norway, Sweden, Denmark, Poland, Flanders (Belgium) and Piedmont (Italy).

The Electromobility+ call was launched in December 2010 and pools some 20 million EUR from the participating countries and regions as well as from the EC within the ERA-NET Plus scheme of the 7th Framework Programme.

The funding initiative aims at the creation of long-lasting conditions for the roll-out of electric mobility in Europe on the horizon of 2025 and covers the following thematic scope:

1. Energy and environmental policy approach
2. Usage patterns, economic models, actors involved
3. Technical dimensions of the recharging systems
4. Testing, trials and normative standards
5. Technology based Innovation

In total 40 proposals have been submitted. The evaluation of the proposals followed a 2-step procedure. Immediately after the closing of the call the evaluation on national/regional level started (step 1), followed by a peer-review of independent international experts (step 2). This evaluation process and the subsequent negotiation process resulted in funding of 18 research projects.

Research projects funded

The research projects funded are listed below in the order of three key dimensions: Socio-economic issues, Technological strategies (including grid management) and Research & Development.

Duration and results

The research projects have started step-by-step from mid 2012. First results will become available in 2014. Final results on the projects funded by the Electromobility+ initiative will be presented during the final event scheduled for spring 2015.

Socio-economic issues

- COMPETT
- DEFINE
- eMap
- EV-STEP
- E-FACTS
- SCelecTRA
- SELECT

Technological strategies

- ABattReLife
- CACTUS
- DAME
- EVERSAFE
- EVREST
- NEMO
- Speed for SMEs

Research & Development

- FCCF-APU
- K-VEC
- MaLiSu
- MATLEV

COMPETT

Competitive Electric Town Transport

www.compett.org

Although electrified vehicles have existed for years, the number of such vehicles in practical use is most limited compared to the number of internal combustion engine vehicles (ICE). The objectives of this project is the reduction of CO2-emissions by increased use of electrified vehicles through better knowledge of the barriers against and potentials for electrified vehicles, including reduced road traffic noise. Fully electric vehicles, plug-in hybrid electric vehicles, fuel-cell hydrogen vehicles and electric two-wheelers have different functionalities and may face different barriers and potentials. Important questions are:

- How can electrified vehicles come into use to a greater degree?
- What are the most likely niches for electrified vehicles?
- What kind of electrified vehicles can most easily become alternatives to internal combustion engine vehicles?
- How can different kinds of electrified vehicles be applied for different kinds of trips?

Austria, Denmark and Norway participate in the project with a total of five partners representing research, local authorities and businesses. The COMPETT project will shed new light on the appropriate role of the government in the take-off stage and the creation of a self-sustaining market for e-vehicles. The project will use travel surveys, local case studies, consumer surveys, statistics and market information together with economic assessment tools as inputs into the Serapis market uptake model. The model allows the project to generate estimates of the potential for electrification in the regions studied in the cases, in the partnering countries and in Europe as a whole, under different scenarios of market development, policies and incentives. COMPETTs recommendations will address the different role of the different stakeholders or actors. Finally the consequences is investigated and the results are summed up in a comprehensive report and a practical guideline handbook on Electromobility.

Project Data

Funding/€	Total cost/€	Duration
1.433.764	1.433.764	36 months

Partners

Transportokonomisk Institutt, NO
Danish Road Directorate, DK
Austrian Energy Agency, AT
Buskerud University College, NO
Kongsberg Innovasjon AS, NO

>>Competitive Town Transport<<

The Mitsubishi I-MiEV vehicle shown was the first EV to reach a sales volume of 1000 in Norway. The building in the background is the Town hall in Oslo, Norways capital. Oslo is home to the largest EV fleet in the country.

DEFINE

Development of an Evaluation Framework for the Introduction of Electromobility

www.ihs.ac.at/projects/define

Electromobility is often proposed to be the solution for the problem of combining individual transportation with an ecologically sustainable development. A prediction of the effects on the economic environment triggered by the anticipated change in the mobility paradigm from a fossil fuelbased individual transportation system to one relying on electromobility and public transport requires comprehensive analyses. Thus, the consortium intends to estimate and assess the full economic costs associated with a higher share of electromobility in a framework that suits the complexity of the matter, considering economic and environmental benefits.

The core of the project consists of a significant extension of the existing hybrid bottom-up top-down general equilibrium model of the Institute of Advanced Studies (IHS) in regard to the traffic and electricity sectors. Based on scenarios for transport and energy developed by the Umweltbundesamt for Austria and the Öko-Institut for Germany, this model will be used to conduct a cost-benefit analysis in regard to electromobility for Germany and Austria. Additionally, IHS and the Center for Social and Economic Research (CASE) will analyse consumer behaviour and mobility patterns based on original household-level surveys, the results of which will enter the general equilibrium model.

In parallel, the German Institute of Economic Research (DIW) and the Institute for Energy Systems and Electric Drives (ESEA) of the Vienna University of Technology elaborate on existing unit commitment models and develop these into a partial equilibrium electricity market model to assess the technological interactions between electromobility and the electricity sector. The environmental benefits of the anticipated shift in the mobility paradigm are then quantified departing from model results by CASE, who will also assist in applying both models to Poland to demonstrate how this framework can be extended to any country of the European Union.

Project Data

Funding/€	Total cost/€	Duration
1.022.897	1.036.815	30 months

Partners

Institut für Höhere Studien, AT

Deutsches Institut für Wirtschaftsforschung, DE

Umweltbundesamt, AT

Technische Universität Wien – Institut für Energiesysteme und elektrische Antriebe, AT

Öko-Institut e.V., DE

CASE – Center for Social and Economic Research, PL

>>Evaluation Framework for Electromobility<<

E-FACTS

Electric Vehicles For Alternative City Transport Systems

E-FACTS aims at speeding up the uptake of EVs through a number of carefully chosen demonstrations of EVs for city distribution and passenger transport, together with public charging possibilities which also includes the issues of keeping even pace with a growing number of EVs, avoiding vandalism and still keeping accessibility for all citizens, making sure the electricity is green whoever delivers etc. The project will also promote other stakeholder to set up charging facilities at parking lots, garages, shopping malls, park'n'ride, airports etc according to the recommendations developed by the project. A fourth task is to analyse the incentives needed by drivers to adopt EVs and to investigate the carbon footprint and perceived risks like fires.

Arnhem will introduce 4 hydrogen-electric buses and one prototype trolley-bus with batteries, Frankfurt will set up a pool of commercial vehicles and Stockholm will set up a test fleet where companies may test EVs for about a week - a method that has shown very successful when introducing e. g. biogas vehicles. A few EVs will also be introduced in a car club to allow for private citizens to test EVs without having to buy one.

The evaluation where Frankfurt University of applied science have the largest role, will i. a. show how well the EVs fulfill the drivers' need in real life driving, how charging is utilised and if EVs influence driving behaviour.
The conclusions will be used to reach potential new EV-users, to fine-tune future incentives and will be spread to other cities and also to governments and the EU Commission.

Project Data

Funding/€	Total cost/€	Duration
690.390	1.408.836	27 months

Partners

City of Stockholm, SE

Frankfurt Economic Development, DE

University of Applied Sciences Frankfurt, DE

City of Arnhem, NL

>>Reach the EV-users<<

eMAP

electromobility - scenario based Market potential, Assessment and Policy options

www.project-emap.eu

The project eMAP concentrates on the analysis and assessment of the market penetration of electric vehicles and its socio-economic impacts. In this process feasible deployment paths of electric vehicles are investigated for the time horizon until 2025-2030. This is done by a scenario based market model which specifies the demand potential and market supply of electromobility. The socio-economic impact of the deployment of electromobility is evaluated using different scenarios. Political support measures and strategies for electric vehicles are identified and their impact on the deployment path is analysed and evaluated. In the end, recommendations for optimised political strategies are derived.

During the first phase of the project duration several prerequisites for the scenario modelling and evaluation of market penetration trends have been created. Besides the technological characteristics of electric vehicles, the current situation of electromobility in terms of initiatives and present market penetration has been analysed for the EU as well as the eMAP partner countries Finland, Poland and Germany. Based on these findings, the project's research questions and targets have been derived. In a second step, the methodological links between research needs, data collection, scenario modelling, assessment and policy evaluation have been set up.

Furthermore, an overview of the stakeholders of electromobility has been compiled by analysing the relevant vehicle markets in Europe, USA and Asia. Trans-national information about published scenarios and forecasts of the market development of the future vehicle fleet in individual passenger transport has been collected, analysed and clustered. Finally, a framework for final evaluation of market pene- tration and impacts of electromobility has been constructed using parameter categorisation for the key parameters of electromobility, as well as political goals.

To learn about consumers' awareness of electric drives and their willingness to use and buy these cars, a consumer survey was designed. A total of 6 000 online interviews were conducted in the European Union, focussing on eMAP partner countries. Survey results are currently analysed and will be published in early 2014. Besides socio-economic and car related background information on the consumer, the survey captures attitudes towards electromobility. Other topics are the decision making process in the car purchase and the impact of policies and other measures on the purchase decision.

Project Data

Funding/€	Total cost/€	Duration
1.220.359	1.240.384	33 months

Partners

Federal Highway Research Institute, DE

German Aerospace Center, DE

VTT Technical Research Centre of Finland, FI

Motor Transport Institute in Warsaw, PL

>>Promoting Electro-mobility<<

EV-STEP

Sustainable Technical and Economic Pathways for Electrified Mobility Systems in EU28 by 2030

www.ev-step.com

Pure and Plug-in-Hybrid electric vehicles can provide an appropriate technological answer to EU's energy and environmental strategic goals. But, to avoid a carbon or efficiency leakage from the end-use to the energy supply level, assessments must be performed in an inclusive framework. Building such a framework is complex due to the technological dimension in which the transport system interacts with a highly diverse mobility demand and with the electric system and energy system more largely.

Introducing a long term prospective dimension and the possible transformation of those interrelated systems increases the complexity of the task. By expanding existing system analysis tools, the aim of the EV-STEP project is to develop a framework for such an integrated assessment in order to assess the key technical and economic conditions of an increased electrification of European transport systems while covering the spatial heterogeneity of its territory. The originality of the methodology is to associate in a common analysis a bottom-up energy systems optimisation model and a static computable general equilibrium model. The MARKAL/TIMES and IMACLIM-S modelling frameworks are used. EV-STEP's contribution to Electromobility+ is the evaluation of electric vehicles roadmaps, of their implications for the interconnected European electric and energy system and, on the economic side, the assessments of some impacts on EU28s economic input-output balance. The project was started the 1st October 2012 and is scheduled for 24 months.

Project Data

Funding/€	Total cost/€	Duration
502.660	734.634	24 months

Partners

Association pour la Recherche et Developpement des Methodes et Processus Industrielles, Centre de Mathématiques Appliquées, FR

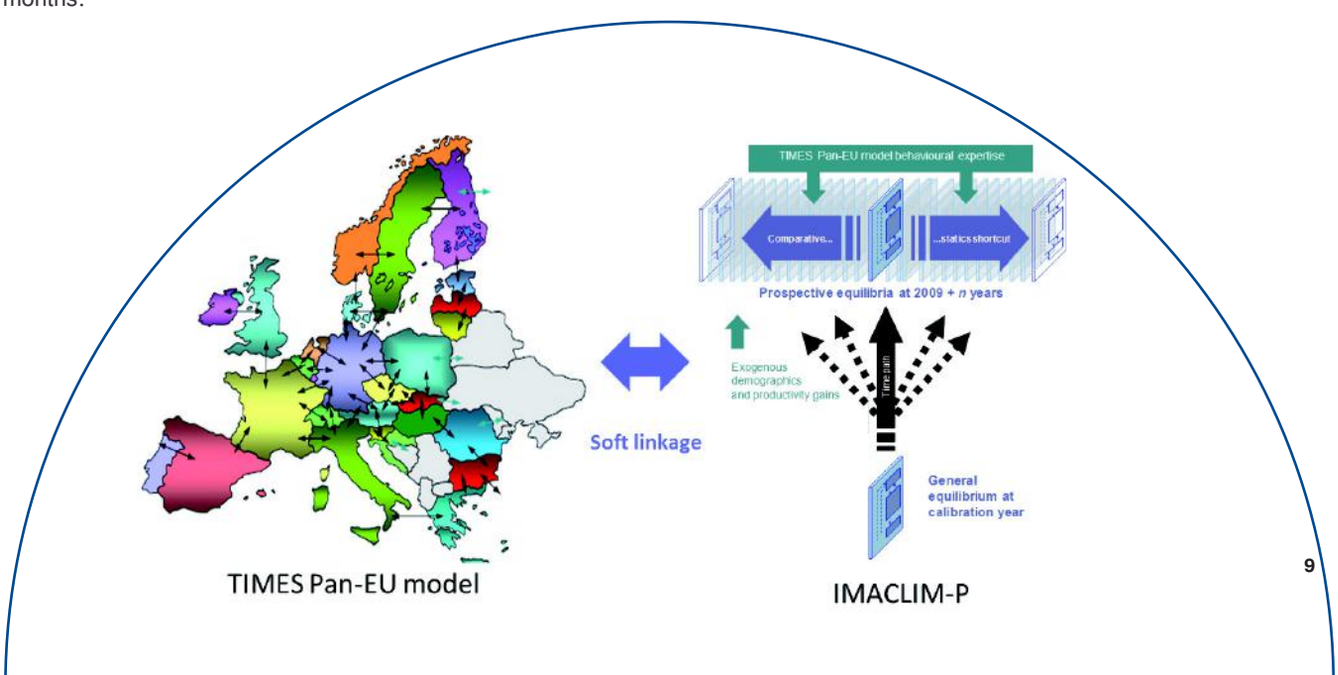
Institute of Energy Economics and the Rational Use of Energy (IER); University Stuttgart, DE

Risø DTU, Technical University of Denmark, DK

Société de Mathématiques Appliquées et de Sciences Humaines, FR

During the first reporting period the efforts were focused on a better understanding and characterisation of the electromobility context as well as model updates. In particular a review of the rationale of support mechanisms in the three countries and data collection on vehicle technologies and recharging infrastructures were targeted. The consortium also identified the extension to EU28 as a main step to ensure that the models and results remain up to date at the end of the project. Due to the short duration one main decision and development of the first period was to advance the models expansion in order to adapt early in the project's life their structure to include Croatia.

>>2030 Deployment scenarios<<



SCelecTRA

Scenarios for the Electrification of Transports

SCelecTRA is about depicting the future of Electromobility in Europe. The project is aiming at gathering different approaches: economic, environmental, political and technical to figure out the best ways to promote the arrival of electrified vehicles such as electric and hybrid vehicles. This unique mix of approaches will allow

- to study the public policies which have been used in the past in order to know which are most effective,
- to model as accurately as possible the different conditions to create a market for electrified vehicles,
- to assess the impacts they will have on the energy sector and how they will help us to move towards a more environment friendly transport sector not as individual solutions but as a mix of solutions as a whole,
- draw a clear roadmap of the actions which should be used in order to create as soon and as effectively as possible a mass-market electromobility in Europe.

Project Data

Funding/€	Total cost/€	Duration
455.179	689.000	36 months

Partners

IFP Energies nouvelles, FR

IFSTTAR, FR

PE CEE, AT

KanLo Consultants, FR

EIFER, DE

>>Scenarios for the Electrification of Transports<<

SELECT

Suitable ELEctromobility for Commercial Transport

www.select-project.eu

The commercial transport sector is of particular relevance for the overall transport system and its climate impact. It is assumed to be one of the early adopters of electromobility. In order to increase market penetration, SELECT will provide deeper knowledge on commercial transport with respect to the potential for electromobility. Special emphasis will be given to usage patterns and related technological and organisational requirements.

As research will consider the actual state and expected development in different European countries, national similarities or differences will be taken into account. Survey data to be collected during the project will provide the empirical background for in-depth analysis. Respective findings will be used twofold: First, a methodological framework will be developed that builds the basis for further industrial development of tools and services that address new opportunities and challenges when utilising EV within commercial fleets. Second, recommendations will be derived addressing the broad range of stakeholders including policy, industry, and users. Recommendations will consider not only technological solutions, but also economic, political and infrastructural environments notably supporting the customer's shift from conventional to electric vehicles.

Stakeholders such as logistics operators, industry, academia, and policy will be consulted through-out the project to benefit not only from their particular perspective and in-depth knowledge, but also to address and meet their interest. Within the SELECT consortium research institutions will work together with business companies that already have integrated electric vehicles into their fleets or are going to develop supporting services.

Project Data

Funding/€	Total cost/€	Duration
1.545.584	1.821.048	36 months

Partners

- German Aerospace Center, DE
- Danish Technical University, DK
- Austrian Institute of Technology, AT
- CLEVER A/S, DK
- Consilio Information Management GmbH, AT
- Reffcon GmbH, AT

>>Electro-mobility in commercial Transport<<

SELECT
Suitable ELEctromobility for Commercial Transport

ABattReLife

Automotive Battery Recycling and 2nd Life

www.abattrelife.eu

The development of Electrical Vehicles (EV) has become a key challenge in the worldwide automotive industry. The most important technological breakthrough should come from the development of new generation of batteries. While these new generation of batteries are emerging, ABattReLife proposes to gather automotive industry players, together with strong academic institutions in order to assess the technological barriers for a better battery life cycle as well as the most appropriate technologies to ensure a re-use of the batteries at the end of the optimal lifecycle.

The main objective of the project is the development and implementation of a knowledge base on high voltage traction battery deterioration; a safe management structure for EV battery recycling; strategies and technologies for battery re-use and recycling.

ABattReLife gathers stakeholders from France, Germany and the Netherlands in order:

- to develop a technology for optimised materials recuperation from battery waste,
- to recycle EV batteries,
- to set boundary conditions for the use of batteries in the first stage of the lifecycle.

After an analysis of batteries behaviour and degradation phenomena (WP1), the consortium will assess in parallel the options to use EV batteries in second life applications (WP2) and the recycling technologies solutions at the end of life of the battery (WP3). Once this new knowledge will be structured and available, new value-chain and business models for recycling and re-use should be proposed (WP4) before carrying out a feasibility study and small scale pilot (WP5).

The project should therefore allow Academic to transfer their knowledge to Industry; Industry to develop a non-existing value chain; users to get more information on battery behaviour; and policy-makers to develop public policies to promote the penetration of EVs into the market.

Project Data

Funding/€	Total cost/€	Duration
1.661.989	2.138.394	36 months

Partners

- Peugeot Citroën Automobiles SA, FR
- Bayerische Motoren Werke Aktiengesellschaft, DE
- Nederlandse Organisatie Voor Toegepast Natuurwetenschappelijk Onderzoek - TNO, NL
- KEMA Nederland B.V., NL
- Fraunhofer Institute for Silicate Research ISC, DE
- Pôle Véhicule du Futur, FR
- Technische Universität München, DE
- Technische Universität Bergakademie Freiberg, DE
- Université de technologie Belfort-Montbéliard, FR
- Université de technologie de Troyes, FR

>>Degradation, Re-use, Recycling.<<

CACTUS

Models and Methods for the Evaluation and the Optimal Application of Battery Charging and Switching Technologies for Electric Busses

www.cactus-emobility.eu

A bus in public transportation covers an average distance of 250 to 300 km each day. A suitable battery that would enable the bus to run for such a long distance without having to be recharged would be far too big, heavy and expensive. In order to overcome this problem, several technical approaches are currently being investigated.

The available technical solutions must be considered separately against the prerequisites and requirements of every single public transport company in terms of transportation, technical, economic and environmental aspects. Only on this basis a decision for a technology can be made that optimally meets the requirements of a public transport company. The ultimate goal of the CACTUS project is to find the best technical solution for the participating associated public transport companies depending on their real input data (timetable, operation plan, etc.). Of course, the best solution may vary between the participating public transport companies due to the strongly different prerequisites, assignments and aims. The best solution does not only involve a technology, but also its optimal application.

To achieve this aim, models of all relevant transportation, technical, economic and ecological values will be elaborated. Methods will be developed to find the most suitable technical solution (depending on the input values) and to apply it in an optimal way.

Until summer of 2013, the following main project results have been achieved: The questions to be answered during the project have been collected and described in detail. An extensive investigation on energy storage technologies, energy transfer technologies as well as battery charging modes and battery exchanging technologies have been performed. A lot of types of electric busses being composed of these technologies have been researched. Transportation, technical, economic and ecological models have been created. The development of evaluation and optimisation methods has been started.

Project Data

Funding/€	Total cost/€	Duration
773.590	838.380	36 months

Partners

Institut für Automation und Kommunikation e.V. Magdeburg, DE

Fraunhofer Institute for Materialflow and Logistics, DE

Silesian University of Technology, PL

>>Promote Electric Busses<<

DAME

Development, validation and application of an agent based modelling approach for optimal integration of electromobility in electricity distribution grids

The realisation of a high penetration of electric vehicles (EV) to enable a more sustainable society will have consequences for the electricity grid. This electricity grid will mainly be used to charge the EV fleet and therefore has to be designed adequately to do so. Intelligent EV charging strategies will not only contribute to an affordable and reliable electricity grid, but will also enable a better integration of renewable energy generation in the total power system.

The DAME project focuses on strategic research on technical aspects of charging and distribution systems, and more specifically on the research topic Managing the Power Grid. Therefore, it takes a distribution network operator's perspective to identify and examine the specific challenges of the integration of electromobility.

In order to accomplish those aims, the main objectives of the project are; the generation of charging patterns that fulfill three criteria: user needs, network capacity and market integration for various penetrations of electric vehicles, development of algorithms to optimise the charging patterns, development of an approach to combine traffic and energy flow aspects and adapt control strategies and the investigation of the impact of electromobility on distribution grids.

For the generation of charging patterns, an agent-based approach is used. This means that the agents examined in the network modelling tool, are defined as various data objectives representing electric vehicles, active grid components or household loads.

As an outcome of the project, a scenario platform will be implemented which generates scenarios to analyse future distribution grid situations. This scenario platform can be used by network planners and operators for electrical power system analysis.

At the time of writing, the requirements for the tool have been determined. Also a database containing the distribution system operator's (DSO) medium voltage networks, the geographic and demographic layers and measurements of distribution transformers, smart meters, photovoltaic (PV) modules, and electric vehicles has been implemented. From this database representative networks were determined to be used in further testing and development of charging strategies.

Furthermore, a model using network, geographic and demographic data is developed to generate driving and charging patterns for the EVs. The model will be tested in the DSO's service area and a simulation tool is developed to assess different charging strategies as uncontrolled charging, reducing grid stress/ lowering charging losses, and matching renewable energy generation.

Project Data

Funding/€	Total cost/€	Duration
625.171	625.171	36 months

Partners

Enexis B.V., NL

Eindhoven University of Technology, NL

RWTH Aachen University, DE

>>Smart grid planning<<

EVERSAFE

Everyday Safety for Electric Vehicles

www.eversafe-project.eu

The EVERSAFE project aims at evaluating every day safety for electric vehicles (EV). This motivates investigation over a broad scope of areas covering user attitudes and vehicle safety issues addressing active and passive safety. Uncertainty in the consumer's perception of electric vehicles (e.g. safety of batteries in crash situations, risk of electric shock during charging, etc.) can lead to negative safety evaluations. To address these concerns focus group sessions were conducted.

In total, 25 safety concerns distributed over 4 distinct categories were identified. It was concluded that safety-critical aspects vary both in terms of type of interaction and human involvement. These results allow to further adjust technical testing at the same time as the general public safety concerns are addressed.

Passive safety considerations for vehicles with traction batteries were studied since the layout of vehicle components is sensitive to the mechanical loading in collisions. A review of the distribution of crash types involving high acceleration or deformations was performed, where side and rear impacts were identified for further study. A model of an electric vehicle and critical sub components are under development. The goal is to apply the load cases, identified from real world collisions, in simulations and establish critical conditions for the energy storage system (ESS) which are not fully addressed in current regulations and standards. In parallel to these investigations, the electro-chemical behavior of ESSs is also being investigated.

Under the active safety scope, faults in the powertrain of a vehicle were studied since they can influence dynamic stability during driving. This can compromise safety for occupants and surrounding traffic. With this in mind, specific faults in an electric power train were identified and simulated. Three typical faults in an electric power train were selected, i.e. an inverter shut-down, a short circuit in the electric machine and a failure in the regenerative braking system. These were taken for further analysis with real drivers at a test track experiment and in a driving simulator study.

Project Data

Funding/€	Total cost/€	Duration
1.408.398	1.617.576	24 months

Partners

- Swedish National Road and Transport Research Institute, SE
- Technische Universität Chemnitz, DE
- Fraunhofer-Gesellschaft, DE
- Volvo Car Corporation, SE
- KTH, Royal Institute of Technology, SE
- Federal Highway Research Institute, DE

The final outputs of the work done in the EVERSAFE project will be compiled as recommendations for safety standards which can be used for future legislative actions and handling guidelines.

>>Electrical Vehicle Safety<<

EVERSAFE

EVREST

Electric Vehicle with Range Extender as a Sustainable Technology

www.evrest-project.org

EVs are expected to be an effective solution to cope with pollutant and noise emission in urban areas. However, the EV market penetration is still very weak mainly because of the high cost and the limited range. On the other hand, European statistics show that a large proportion of the daily trips are far below the maximum range announced for the new generation of EVs. This means that the range problem is either psychological or occasional.

The main idea of EVREST project is to study how Electric Vehicles (EV) with a Range Extender (RE) could match the different usage patterns while decreasing the battery size (cost), fulfilling occasional long trips and ensuring the user to reach his destination in case of battery failure. A global evaluation of this solution is then proposed and contributes to develop scenarios of electromobility including BEV and EREV. The approach proposed and partially developed during the first year takes into account the users mobility needs through the study of mobility surveys in three European countries: Germany, France and Austria (WP1). In this field, after a preliminary process of data selection over a first sample of 14 European surveys, 9 relevant surveys classified in 3 categories were selected to give a preliminary overview in the field of European electromobility. From a harmonised statistical arrangement, mainly of the users' daily car mileages, a range target is studied and different sizes of battery and RE are simulated using accurate car and components models. The first results showed a possible reduction of the EV battery size while using a relatively small RE. After an ongoing interaction with the user expectation evaluation (WP6), the range target as well as sensitive parameters like the minimum speed tolerated by users will be more accurately introduced in the sizing procedure in order to have one or more EREV solution per vehicle class (two classes are considered: small and middle).

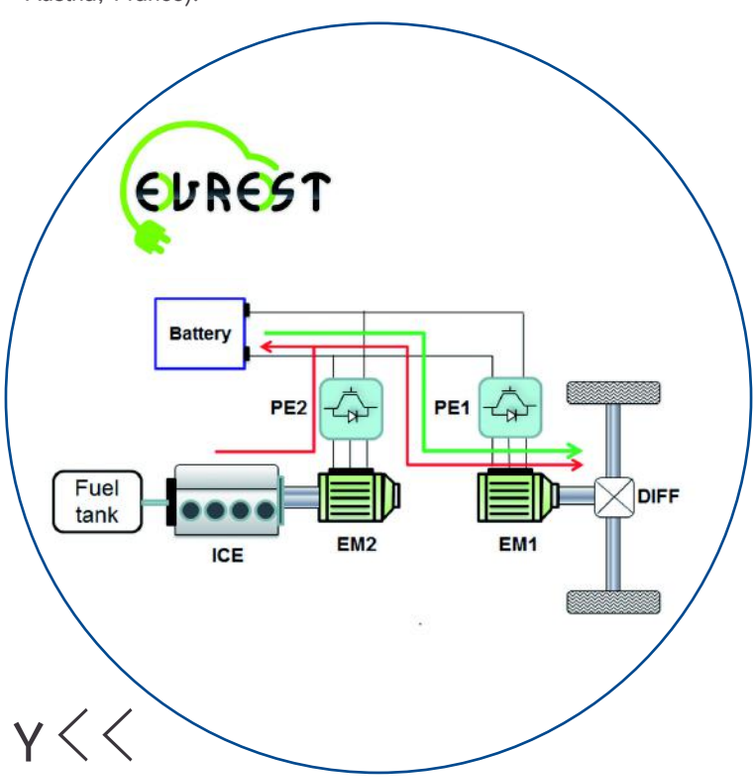
Project Data

Funding/€	Total cost/€	Duration
973.466	1.326.640	36 months

Partners

- Institut Français des Sciences et Technologies des Transports, de l'Aménagement et des Réseaux, FR
- Karlsruher Institut für Technologie, DE
- Technische Universität Chemnitz, DE
- Universität Stuttgart, DE
- University of Natural Resources and Life Sciences, Institute for Transport Studies, AT
- Centre National de la Recherche Scientifique, FR
- PEUGEOT Scooters, FR

Waiting for final solutions to evaluate, the LCA work has progressed in data collection and the development of regionally differentiated LCA methodology. In the meantime, scenarios for establishing electromobility (WP3) that include EREV have been studied and submitted to discussion during an expert workshop. Based on the results of WP1 and in cooperation with the project partners a first draft of scenarios was developed for each of the countries involved (Germany, Austria, France).



>>Range Extender and Sustainability<<

NEMO

Novel E-Mobility Grid Model

www.nemo-project.eu

The „Novel E-MObility Grid Model NEMO“ project aims on managing the power grid within the key dimension „strategic research on technical dimensions of the recharging, storage and distribution systems“. The project lasts from May 2012 to April 2015.

NEMO challenge – The rapidly rising number of electric vehicles (EVs) will lead to a strong growth in electricity demand. As charging spots and stations will be connected to the existing grid the electricity for the EVs has to be transported by the existing or moderately adapted electricity infrastructure. If charging demand exceeds capacity high investments are needed. Therefore it is important to support grid operators and service providers in assessing the impact of EVs on the power grid and to evaluate possible solutions such as grid extension or load management.

NEMO key idea – The project team's goal is to develop the NEMO simulation and optimisation tool suite to assess the impact of a large number of EVs on the power grid. The tool suite will be based on the existing complementary simulation tools PLATOS, SimTOOL and energyPRO from the project's core partners DNV KEMA, Fraunhofer ISE and EMD. These tools will be further extended for grid impact of EVs, and a framework will be developed to integrate these tools in a cooperative suite for impact studies on all grid voltage levels.

NEMO objectives • Extension of the complementary grid simulation tools PLATOS, SimTOOL and energyPRO • Design of the NEMO tool suite to show and optimise EV network and market aspects • Validation of the NEMO software framework with representative case studies • Derivation of EV benefits for distributed generation (DG) • Description of the grid impact of fast charging spots and mitigation thereof • Solutions for miscellaneous abnormal charging situations • Market maturity of the cooperative tool suite. The project team will ensure the best level of applicability by collaborating with stakeholders taking their needs and requirements into account. Finally, the project team will be able to offer cooperative services together which none of the partners could offer individually.

>>EV GRID IMPACT<<

Project Data

Funding/€	Total cost/€	Duration
905.891	1.166.839	36 months

Partners

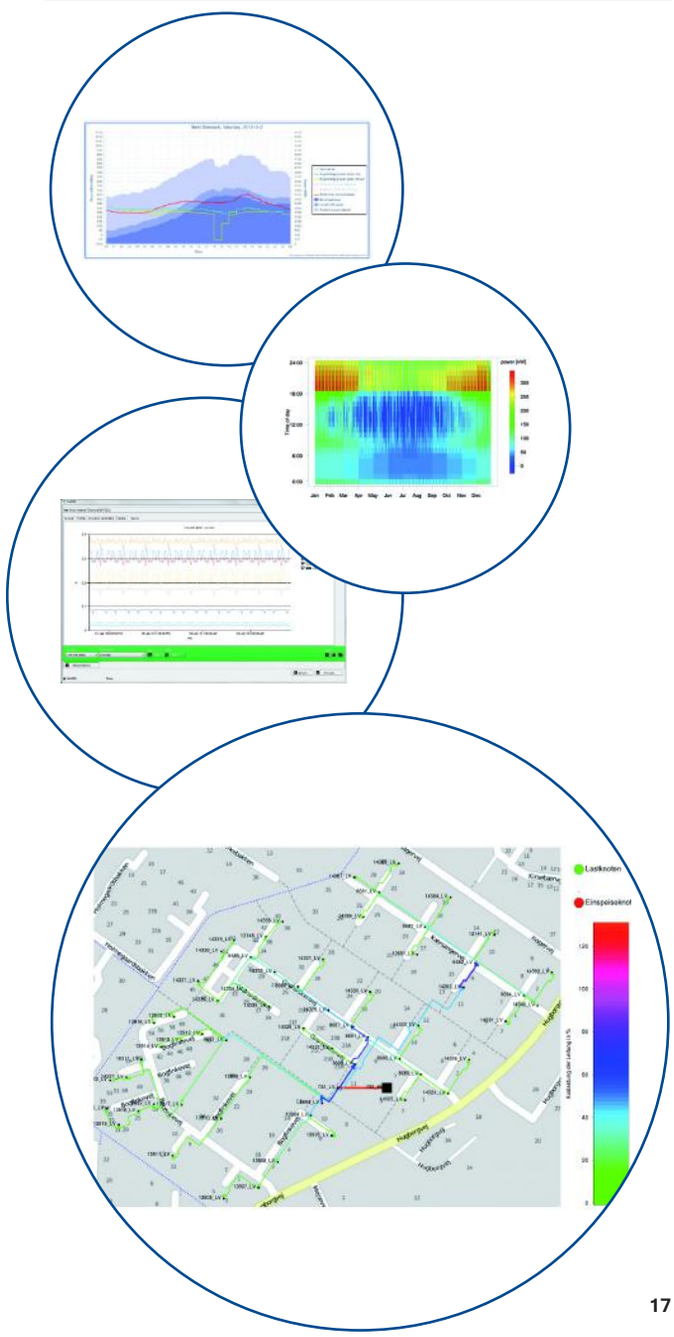
KEMA Nederland B.V., NL

Fraunhofer Institute for Solar Energy Systems ISE , DE

EMD International A/S, DK

Ringkøbing Amts Højspændingsforsyning, DK

Ringkøbing Fjernvarmeværk A.m.b.a., DK



Speed for SME's

Systematic development of Propulsion systems for Enhanced Electro mobility Drive trains

www.rally-e.at

The projects target of "Speed for SME´s" is to create a tool for the suppliers of the automotive industry in the field of e-mobility to develop and test components in a shorter and more cost effective way that it was done before. The main focus is on the small and medium-sized companies in the automotive supply industry.

In e-mobility there are two sides to discover: on the one hand the vehicle itself, on the oder hand the infrastructure for getting energy from the power grid. So the prototype car in Speed for SME´s is divided in a sample of interfaces to put power trains with different drive types (front or rear driven, all wheel drive), lightweighted gearboxes, innovative control units for the e-motors, different battery-modules, communications, future light systems, audio systems for the car sound, etc. together. The prototype car is VW Golf-sized and can be powered up to 300 kW. So the car is ready to be tested under all wheater conditions (winter, summer, muddy, dusty, snow, ice) and all terrains. The testing will be done by a team of engineers and drivers, testing the car all day of a year in Central Europe and not on South Africa or at the North Cape like the car manufacturers do.

This is the cheap and effective way developed in this project to test e-mobility modules. To complete this test-programmes a special trailer for the prototype car will be developed, that is able to recharge empty battery packs and to change the whole battery packs of the car up to 500 kg in a very short period of time (< 5 Minutes). All the concepts for these activities are prepared to be transferred in hardware. In the middle of 2014 the car prototype and the trailer are built and ready for testing components in an effective way to come directly to the market, to the consumers.

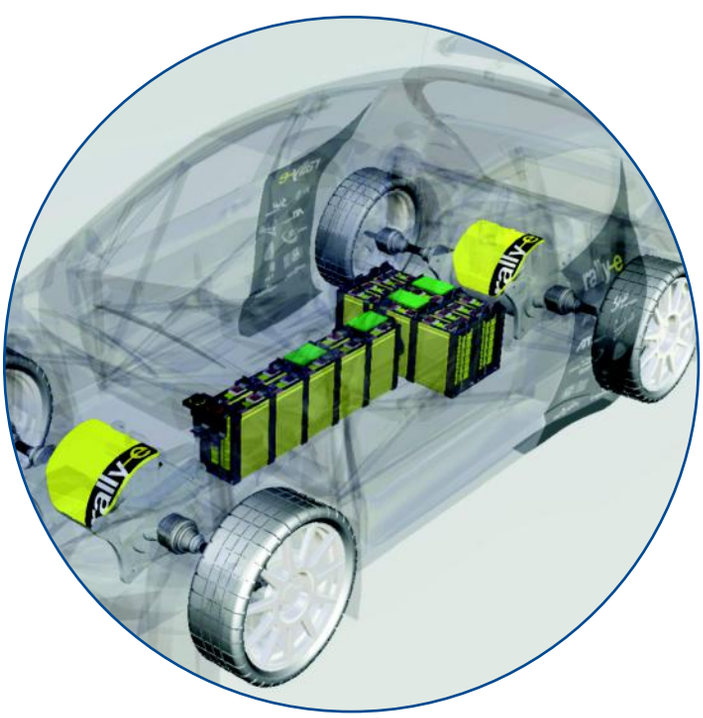
Project Data

Funding/€	Total cost/€	Duration
918.204	1.571.747	36 months

Partners

- J-sigma-b GmbH, AT
- TIC Steyr GmbH, AT
- LKR Leichtmetallkompetenzzentrum Ranshofen GmbH, AT
- Lightweight Energy GmbH, AT
- Smart e-Mobility GmbH, AT
- Lagermax Autotransport GmbH, AT
- Stohl Racing GmbH, AT
- Clusterland Oberösterreich GmbH, AT
- Goodville Consulting GmbH, AT
- EDER GmbH Technical Concepts, DE

>>Speed up e-mobility<<



FCCF-APU

Fuel Cell operating on Conventional Fuels as Auxiliary Power Unit for Electrical Vehicles

www.fccf-apu.eu

The project strives for the development of a fuel cell based Auxiliary Power Unit (APU) for battery electric vehicles using HT-PEMFC fuel cell technology and diesel or petrol steam reforming. In order to accomplish this goal including weight and volume targets activities in system engineering as well as in material development are required.

In the first year of the project, the basic requirements for the system were defined and a first system design layout was developed which allowed for the process simulation. It could thus be shown that water autonomous operation is possible without additional measures up to ca. 40°C. Ways to extend this range have also been determined. On the materials level HT-PEMFC electrodes with reduced sensitivity against high humidity were demonstrated. Additionally two Pt-M bimetallic electrodes were found which were significant less sensitive towards sulphur poisoning. With respect to metal bipolar plates the transfer of the milled design for graphitic plates into a moulded design for metallic bipolar plates was accomplished. Also a protective coating with promising properties in a pickling test was determined.

Finally a commercial catalyst for the steam reforming of petrol and diesel with high conversion rates at acceptable space velocities and temperatures was determined.

Project Data

Funding/€	Total cost/€	Duration
2.219.439	3.272.558	36 months

Partners

Fraunhofer Institute for Chemical Technology, DE

Fraunhofer Institute for Solar Energy Systems ISE, DE

Serenergy A/S, DK

Danish Power Systems, DK

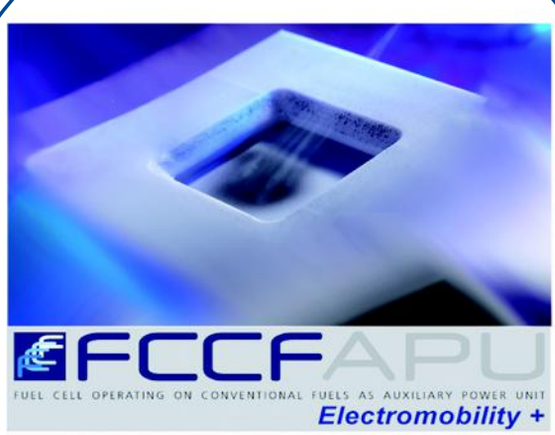
Borit NV, BE-VLG

Impact Coatings AB, SE

WS-Reformer GmbH, DE

Chalmers Tekniska Hoegskola AB, SE

>>Fuel cell operated by conventional fuels<<



K-VEC

Ultrafast and distributed power charge system for high performance on-board energy storage devices

www.kvec.eu

K-VEC is a smart and cost-effective conductive fast charge system between a road infrastructure and an electric vehicle. The vehicle will be charged almost instantly through the road infrastructure integrated with a new charging technology, hence introducing the smart concept of carrying on-board only the necessary energy needed to reach the next bus stop.

This technology increases the potential range of the vehicle at the same time diminishing the weight of on-board storage systems and reducing the operative costs, that are the real bottleneck of the electrochemical battery powered Electric Vehicles. This project started from the observation that battery packs for electric vehicles remain expensive, heavy and failure prone component. These characteristics contribute massively to the unsatisfactory level of use in Europe of purely electric vehicles, despite their obvious environmental and potential economic advantages.

While research on batteries continues, these ones alone cannot solve the main problem of transportation. Such a research approach is mainly leading to incremental improvements which are unlikely to made electric vehicles comparable in range and weight to their conventional counterparts. “Fast switching” battery systems for vehicles have been proposed and tested, but these systems result mostly in the multiplication of the number of batteries (and their cost) per vehicle. Ultracapacitors are rugged, state of the art charge storage devices that, up until now, have not yet found widespread use in vehicles because of their still low energy density ratio and their relatively high cost.

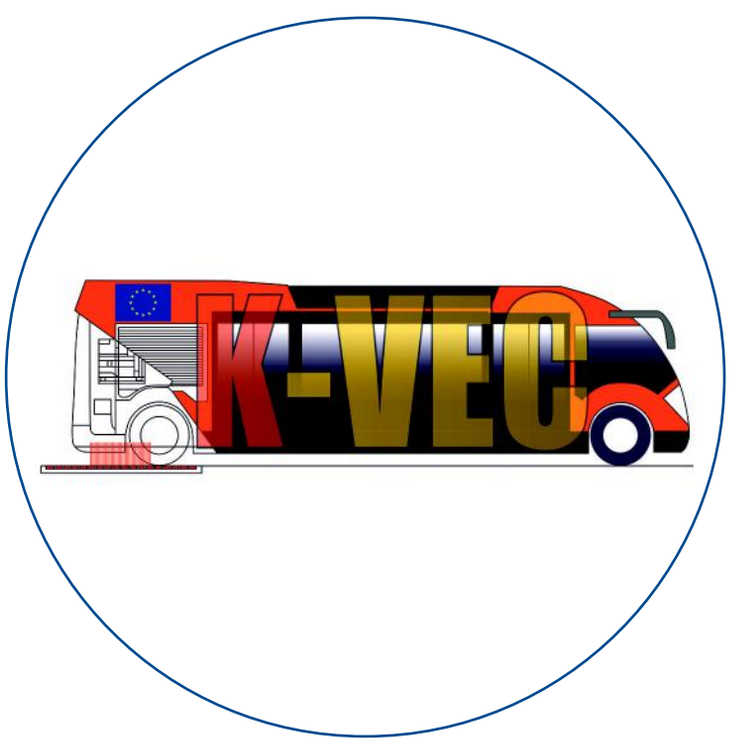
Capacitors, however, have fundamental advantages over electrochemical charge storage systems (batteries) including life cycle (up to 1 million charging cycles without significant loss of efficiency) and the fact that charge and discharge can be very rapid. This allows ultracapacitor vehicles to have good “power on demand” characteristics but, also, allows for very fast charging, a challenge that batteries have sought to overcome by dramatically shortening their life or manually interchanging battery packs. It is this very fast charging ability that is the key of the K-VEC project: reducing cost and weight by smartly storing on board only the minimum amount of energy needed. Since ultracapacitors can be charged very rapidly, energy can be provided “on demand” by charging stations placed in any suitable location. This is a holistic approach to surface transportation that is based on “system thinking” rather than in trying to overcome specific hardware limitations. Such an approach is particularly well suited to public transportation where the regular stops for passengers (smart infrastructures) can become charging points for the ultracapacitors.

Project Data

Funding/€	Total cost/€	Duration
300.624	654.684	24 months

Partners
Sequoia Automation S.r.l., IT
FEBO S.r.l., IT
Bergische Universität Wuppertal, DE

>>A “Key” E-VEHICLE<<



MaLiSu

Nanomaterials for future generation Lithium Sulphur batteries

www.iws.fraunhofer.de/malisu

The MaLiSu project started 01.05.2012. Aim of the project is the development of next generation batteries with significantly enhanced energy densities based on the lithium sulfur chemistry. The energy density of a battery determines the maximum autonomic driving range of electric vehicles and is regarded as the major bottleneck towards broad replacement of fuel driven vehicles until now. Under the leadership of Fraunhofer IWS, the consortium including Uppsala University, Dresden University of Technology, Varta Micro Innovation GmbH and SGL Carbon GmbH work together in this cooperative project covering aspects from basic electrochemistry and material research up to prototype level production.

Since the project start significant progress towards the project objectives has been achieved. The influence of the nanostructure in carbons on their performance in sulfur carbon nanocomposite cathodes has been studied. The carbon materials act as conductive and stabilising framework for the non-conductive sulfur-species. With optimised materials extremely high sulfur utilisation at high sulfur loadings was obtained, exceeding specific capacities of 1.200 mAh g-1 (sulfur mass) and 800 mAh g-1 (electrode mass) being stable for over 50 cycles. Various electrolyte additives were studied and new compounds were identified further enhancing the sulfur utilisation and inhibiting the degradation mechanisms. High performance electrodes were produced through an environmental-friendly dry process route allowing for reproducible results and areal capacities as high as 5 mAh cm-2.

The next important steps of the project will be to scale up the technologies and transfer the results onto industrially prototype level. The researchers within the consortium are optimistic to reach their goal of prototype battery cells exceeding energy densities of 400 Wh kg-1. This result would be an important milestone towards significantly extended driving range of electric vehicles.

Project Data

Funding/€	Total cost/€	Duration
1.285.919	1.827.283	36 months

Partners

Fraunhofer IWS, DE
VARTA Micro Innovation GmbH, AT
SGL Carbon GmbH, DE
Uppsala University, SE
Technical University Dresden, DE

>>Lithium-Sulfur-Battery<<

MATLEV

New materials and technologies for lightweight generic components of electric low-emission concept vehicle

www.matlev.eu

The main goal of the project is to design and offer new solutions in the field of vehicle architecture, based on innovative structural and functional materials. The project focuses on the development of environment-friendly advanced materials and their production processes which will be utilised to produce selected generic components for a Lightweight Electric Low-emission concept Vehicle (LEV). The major requirements for such components are lightweight, recyclability and eco-friendly initial substrates. Reduction of structural weight will be obtained by integrating polymers, natural fibres and textile reinforced composites, ultra-high strength nano-metals and other tailored, multifunctional materials.

In the first step, the requirements and overall specifications for the innovative lightweight electric low-emission concept vehicle components have been defined, taking into account material, process and product requirements as well as virtual conception of the highly challenging and innovative components. Innovative advanced materials, which will be used to produce generic components for new electric vehicle have been selected and developed. Currently they are tested and tuned-up to the needs of component fabrication. In parallel, innovative processes and technologies are being adopted to produce new vehicle components. Selected generic components such as frames, floor/door panels will be produced on the basis of these achievements. All these elements shall be developed in an integrated way, i.e. by combining materials design with fabrication technology.

Project Data

Funding/€	Total cost/€	Duration
680.613	688.205	36 months

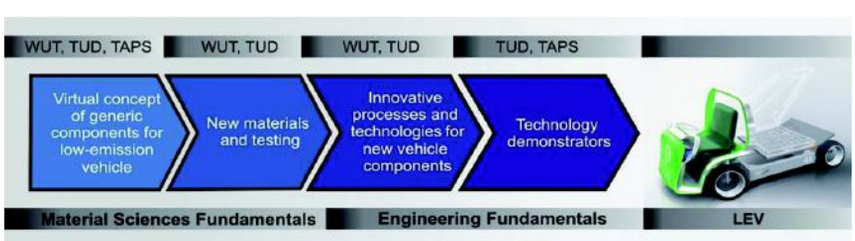
Partners

Warsaw University of Technology, PL

Technical University Dresden, DE

S.Z.T.K. ‚TAPS' – Maciej Kowalski, PL

>>Lightweight Materials and Components<<



Notes

Electromobility+