Federal Ministry for the
Environment, Nature Conservation,
Building and Nuclear Safety

RENEWABLY MOBILE

Marketable solutions for climate-friendly electric mobility

Renewably
mobile

CLEAN

Electric vehicles and solar or wind power are ideal partners – mobile and emission-free.

With vehicular traffic on the increase worldwide, the further technical development of the combustion engine will not be enough to make mobility climate-friendly. Electric vehicles can help in this context – but only if the power they use comes from renewable sources. User-friendly and efficient battery-charging techniques combined with intelligent solutions for the interaction between battery charging and the power grid can ensure that wind and solar energy are put to optimal use. The result can then be zero-emission vehicles that truly make a contribution to climate protection.

PRACTICAL

Introduction for everyday use: the right electro-mobile for every occasion.

The changeover to electric mobility will not happen overnight, so it is especially important to increase the level of public acceptance, despite initially higher costs. One way of getting beneficial technologies onto the market at an early stage is to promote the use of electric vehicles in pioneering segments such as commercial transport. These include not only company fleets and car-sharing, but also diesel-hybrid buses for public transport. If more users gain experience with this technology and more customers opt for an electric car, the range of models on offer will become more varied, e.g. with some cars used only for city driving and others with technology for extending their range. Furthermore, new service models such as battery leasing can make electric mobility marketable if offers are attractive and practically viable for everyday use.

ECO-FRIENDLY

in the use of resources also means taking into account what happens beforehand and afterwards.

Electric mobility must contribute to environmental protection and resource conservation in its entirety and not lead to new resource dependencies. This means that the system of manufacturing the vehicles must follow the principles of closed-cycle resource management. In other words, the future recycling of materials and reuse of individual components should be planned from the outset. For example, batteries can be used for stationary storage purposes after mobile use. Building vehicles according to such specifications requires new production methods and innovative design ideas which create a competitive advantage for German manufacturers today and in the future.

ECONOMICAL

means using energy efficiently and converting it into pure motion.

Electric mobility involves a major boost in innovation in terms of efficiency. One of the main objectives is to be as economical as possible. The classic internal combustion engine converts less than 40 % of the energy generated into motion – electric vehicles manage more than 90 %. Moreover, energy that would normally be lost by braking can be recovered using state-of-the-art technology. To achieve further savings, the overall weight of vehicles must be reduced and ancillary components optimized. Research in this field can also make conventional cars more economical. Plug-in hybrids also combine high efficiency with user friendliness; they have a large range, increasing public acceptance of electric mobility.

OBJECTIVES OF THE SUPPORT PROGRAMME

Global traffic growth is intensifying oil-distribution conflicts and, combined with the resulting rapid rise in emissions, endangering the effectiveness of climate policies. Although electric drives are highly efficient, they will only help fight climate change if the power they use is renewable.

Germany has set itself the target of having a million vehicles with electric drives on the road by 2020, and six million by 2030. Up to now, the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) has allocated more than 100 million to promoting innovation projects run by over 70 partners. The programme is successful and will receive further funding until 2015. All the projects share the vision of making the electric car a marketable environmental innovation. For one thing is clear: a new technology that is clean but unattractive to the consumer is unlikely to be successful. At the same time, more and more consumers also want attractive vehicles to have convincing environmental features. This is a strategic question, not only in terms of ecology but also of economics: only if electric cars have a real environmental advantage will the market also take off. It is this design challenge that we are taking on.

Electric vehicles charged with wind and solar power can sustainably reduce emissions of CO_2 and pollutants, both locally and globally. In addition, the vehicles' traction batteries can make an important contribution to integrating fluctuating energy sources into the grid. At the same time, the development of intelligent solutions for electric cars strengthens Germany's leading role in environmental technology. And, last but not least, the citizens benefit: electric vehicles are not only quiet and clean, but also very economical.

EMKEP research project in Berlin

Smart grids, renewable energy and electric mobility

Power from wind and solar sources fluctuates; its availability varies in terms of quantity and times. This often leads to surpluses that are sometimes wasted for lack of storage capacity. Vehicles' batteries connected to the power grids using intelligent and user-friendly control technologies can serve as temporary energy-storage devices – by using electricity from renewable sources when it is available and in a time-sensitive manner (e.g. when winds are strong at night). Thus, in addition to avoiding emissions, electric vehicles can also contribute to the wider use of renewable energies in other areas and to improving grid stability. This systemic approach represents an important competitive advantage for Germany.

Car field trials

The BMUB's fleet trials focus on the viability of vehicles for day-to-day use and technologies that enable intelligent link-ups with renewable energies. The field trials with private and fleet users provide important insights into a drive's technological maturity, the vehicles' energy requirements and their level of acceptance. They also examine the user-friendliness of technologies for time-controlled battery charging using smart and easy-to-handle interfaces – including inductive methods, i.e. highly efficient charging without cables. The BMUB's support focuses on the development and testing of both fully electric cars and plug-in hybrid vehicles; these are mostly electric-driven, but also make it possible to travel further distances without ‚top-up charging'.

Fleet tests in commercial transport

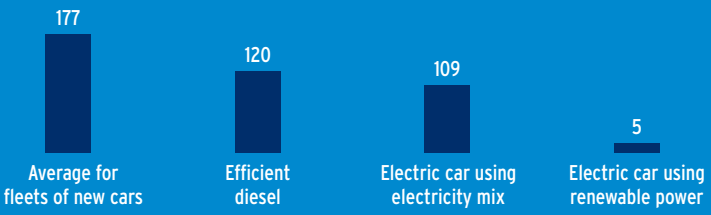
Delivery vehicles and mobile services are ideal for testing electric mobility. Their application profiles are much easier to plan than private car traffic; furthermore, the vehicles regularly return to a predefined base – a logistics centre or the company's parking area – outside their operating times. This means that the recharging infrastructure can be kept relatively simple and offers optimum opportunities for controlled recharging and uniform grid-capacity utilization in the evening and night hours. When driving, the frequent acceleration and braking that is typical of urban commercial transport makes effective brake-energy recovery possible. At the same time, the average daily mileage of such a delivery vehicle is usually limited, so that its range is not an obstacle, even if moderate, cost-saving battery sizes are used. This makes regional delivery traffic a perfect area of application for electric vehicles.

Purchase of diesel-hybrid buses

The funding programme for diesel-hybrid buses in short-distance passenger traffic supports the establishment of efficient hybrid technology in the market for regular bus services. Short-distance buses in particular brake and reaccelerate frequently, with the result that the braking energy can be recovered and used to drive an electric motor. This means that not only CO_2 emissions are reduced considerably, but also exposure to air pollutants and noise, especially at bus stops. The planned funding depends on compliance with strict environmental standards. A comprehensive control programme checks the eligibility criteria and studies the hybrid buses' economic efficiency and technical reliability during operations.

Mini E research project in Berlin

CO_2 emissions from cars (g/km)



Figures for Germany in 2010
Emissions caused by energy supply and vehicle operation
Basis of calculation see www.erneuerbar-mobil.de

Battery recycling

The technical components of electric vehicles also use finite resources, e.g. lithium or cobalt in the traction batteries. The BMUB is therefore promoting a comprehensive resource strategy with the aim of thinking from the outset about recovery systems and recycling, as well as the reuse of components. The development of innovative recycling processes with high recovery rates is important for the competitiveness of Germany's automotive and components-supplying industry – not only due to the scarcity of the materials concerned, but also because Germany is dependent on importing many raw materials.

Accompanying research

The BMUB promotes overarching analyses on the field trials with the aim of identifying which conditions are most suitable for maximizing the positive ecological and economic effects of electric mobility. This is the first time that a holistic environmental assessment and balancing of electric mobility has been carried out. The main research questions are as follows: What emissions are generated by the interaction between vehicle usage, battery charging and power stations? Which drive and deployment options promise maximum efficiency and low environmental effects? Which framework is likely to create optimal growth and employment effects?

CONTACT

Project sponsor on behalf of the Federal Ministry
for the Environment, Nature Conservation, Building
and Nuclear Safety:
VDI/VDE Innovation + Technik GmbH
Steinplatz 1
10623 Berlin
Germany

Tel.: +49 30 310078-155
Fax: +49 30 310078-225
E-Mail: elmo@vdivde-it.de

For more information please visit our website:
www.erneuerbar-mobil.de

IMPRINT

Published by: Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)
Public Relations Division • 11055 Berlin • Germany
Email: service@bmub.bund.de • Website: /www.bmub.bund.de/en
Editor(s): BMUB, Division IG I 5
Triad Berlin Projektgesellschaft mbH
Design: Triad Berlin Projektgesellschaft mbH
Printing: LASERLINE Berlin
Photos: Title page: Triad/Shutterstock.de
P.4: BMW Mini E
P.5: Daimler Vito E-Cell
P.6: KBA (NEFZ)
Date: March 2011
First print: 4,000 copies