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ANNUAL REPORT 2010

NOW ANNUAL REPORT 2010

MAGAZINE

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»OUR STRUCTURES OF MARKET PREPARATION OF NEW TECHNOLOGIES SET THE STANDARD INTERNATIONALLY.«

World leaders in tomorrow's mobility and energy supply.

Mobility is an important cornerstone of our democratic society. Along with a high-performance infrastructure, it is the foundation for prosperity, growth and employment. Modernising our mobility is a long-term task that is constantly confronted with new challenges. Climate change and the foreseeable decline in fossil energy sources certainly count among these challenges. Both of these issues – environmental and climate protection as well as the securing of our energy supply – determine to a large degree the framework conditions for a future-oriented transport policy.

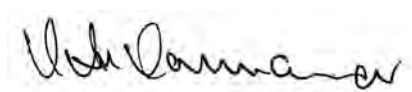
In order to ensure affordable and environmentally-friendly mobility, it is essential to further improve drive technologies that have been used up to now. The optimisation of the combustion engine alone will not be enough to minimise pollutant emissions in road transport. New technologies, alternative drives and fuels are needed, because we want to attain mobility that is as climate-neutral and CO₂-free as possible.

Great opportunities lie in future technologies such as electromobility with batteries and fuel cells – opportunities both for climate protection as well as for our economy which, with the evolution of new efficient and sustainable technologies, have all the promise to secure market leadership in the automotive sector. Aside from batteries, hydrogen and fuel cells play a central role for the mobility and energy supply of tomorrow. In this regard German companies are world class, and we want to build on this position. Germany is set to become the leading market and also the worldwide supplier of electromobility.

That is why we are already supporting these future technologies with two major programmes: the »National Innovation Programme Hydrogen and Fuel Cell Technology« (NIP) as well as the »Electromobility in Model Regions«

funding programme. The Federal Transport Ministry is allocating 500 million euro for research and development through NIP until 2016. For the model regions, 130 million euro is earmarked from the second economic stimulus package until the middle of this year. Funds will also be sourced from industry.

Together with all participants – politics, industry and science – we are working on taking technologies out of the laboratory and into demonstration operation of practical applications, ultimately leading them to market maturity. Our market preparation structures of new technologies are setting the example internationally. In this process the further development of batteries and fuel cells must be viewed broadly and supported in a technologically open way. Therefore both programmes are coordinated by a single body: through the National Organisation Hydrogen and Fuel Cell Technology (NOW). As the organisation managing these programmes at the interface of politics and industry, I wish the organisation continued success in this endeavour.



Dr. Peter Ramsauer, Member of the Bundestag
Federal Minister of Transport, Building and Urban Development





»MARKET PREPARATION IS ONLY POSSIBLE THROUGH CLOSE COOPERATION: POLITICS, INDUSTRY AND SCIENCE MUST POOL THEIR STRENGTHS.«

Global perspectives

National and European climate goals have been politically agreed upon: less CO₂ emissions, more energy efficient products in the transport area and in energy supply to buildings and safety in energy supply. We can only achieve these goals through the further development and deployment of new technologies. The Federal Ministry of Transport, Building and Urban Development has tasked the National Organisation Hydrogen and Fuel Cell Technology (NOW GmbH) with preparing the future-oriented key technologies of hydrogen with fuel cells and battery-electric drives for the commercial market. Both will play an important role in future mobility and energy supply.

Preparing the commercial market with partners

Market preparation is only possible through close cooperation: politics, industry and science must pool their strengths. This is because it is not possible for industry alone to establish future-oriented products on the market in everyday business operation. Reliable support structures from the public sector are as important as the coordinated and, in a way pre-competitive cooperation of companies. In the programmes coordinated by NOW - the National Innovation Programme Hydrogen and Fuel Cell Energy (NIP) and the Electromobility Model Regions - these approaches are put in action. In the NIP lighthouse projects and the eight German electromobility model regions, different players from industry, science and the public sector link up their specific initiatives in order to advance a particular issue together.

Hydrogen in the transport area

An outstanding NIP lighthouse project is the Clean Energy Partnership (CEP). It is an initiative of leading industry partners - GM/Opel, Berliner Verkehrsbetriebe (Berlin Transport Company), BMW, Daimler, Ford, Hamburger Hochbahn (Hamburg company operating underground and bus services), Linde, Shell, Statoil, TOTAL, Toyota, Vattenfall and Volkswagen - for the preparation of hydrogen mo-

bility. The increase in customer acceptance, the testing of fuel cell vehicles and the gradual build-up of vehicle fleets and infrastructure in key regions are at the forefront of the project.

In the past year the CEP has taken a great step forward: vehicle fleets were more than doubled, another hydrogen fuelling station was opened in a central location in Berlin and the membership numbers of the CEP increased. A strong international automobile partner has been added with Toyota - five Toyota Hybrid fuel cell vehicles are already part of the CEP fleet. Aside from the current key regions of Berlin and Hamburg, hydrogen mobility will also be tested in North Rhine-Westphalia and Baden-Württemberg.

In addition the structures of the H₂Mobility initiative were strengthened for the build-up of a nationwide hydrogen structure in 2010. The groundwork is now laid to come to result in terms of a common business plan by 2012. Parallel to this over 30 leading companies have collaborated in the study: »A portfolio of powertrains for Europe«. Thanks to the comprehensive contribution of all companies involved, this fact-based report provides a highly reliable glimpse into the future of mobility.

Battery-electric drives

In future a whole range of fuels and drive types will exist. Battery-electric operated vehicles will also become a commercial factor, and will for example be attractive for customers in urban centres. In eight model regions it will be assessed what role electromobility can play in the future. The variety of products ranges from small cars to commercial vehicles to two-wheeled electric vehicles. The build-up of a public charging infrastructure is of the highest priority here as well. The production of electricity in the model regions from renewable energy is a significant feature of the projects and initiatives. This applies also to the hydrogen

»THE CURRENT KNOWLEDGE AND TECHNOLOGY STANDARD OF GERMAN COMPANIES SETS THE TREND GLOBALLY.«

for fuel cell vehicles. The Electromobility Model Regions Programme accesses funds from the second economic stimulus package and will thus be concluded by the end of 2012. Because the market preparation of the technology will not be completed by then, it is already now necessary to seriously discuss a long-term public sector funding programme.

Stationary fuel cells

Callux, the NIP lighthouse project in the area of stationary fuel cells in household energy supply, has made great advances in the past year. Over 100 applications are currently in the field, and more and more units will go into operation, so that in the coming years up to 800 fuel cell heating systems will be in operation. All participating parties – energy suppliers, heating system manufacturers and not least the customers – are all very satisfied with the units and the insights gained. With an entire training tool kit for the crafts sector, engineers and architects, Callux has made the next step towards commercialisation.

Special markets

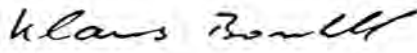
The development of special markets, which are so important in opening the door to the market for hydrogen and fuel cell technology, can also be given a positive assessment. Currently companies in the Clean Power Net Initiative have decided to highlight fuel cell products in the area of uninterrupted energy supply. The launch of the first concrete plans in telecommunication and public safety communication systems is imminent.

Pioneering the way

With coordinated structures promoting not only research and development but also primarily demonstration projects, NOW is already setting the global standard at the interface of individual stakeholders. The current knowledge and technology standard of German companies sets the trend globally.

Nevertheless, the market launch of sustainable products requires strong political partners. This goes for existing programmes and projects, but also for new business areas and issues such as using hydrogen to store energy from wind and the nationwide build-up of a hydrogen infrastructure. Concrete programmes must be implemented shoulder to shoulder with industry and science. Only through the market leadership in efficient or even zero-emission

technologies can Germany build up its global competitiveness internationally. If it asserts itself as the long-term leading market and leading supplier, market concepts will take root around the world – for our future, the environment and our people.



Dr. Klaus Bonhoff,
Managing Director (Chair) NOW GmbH



Nationale Organisation Wasserstoff-
und Brennstoffzellentechnologie

The NOW

NOW GmbH (National Organisation Hydrogen and Fuel Cell Technology) was founded in 2008 by the Federal Government, represented by the Federal Ministry of Transport, Building and Urban Development (BMVBS). The task of the NOW is to coordinate and manage two federal funding programmes: the National Innovation Programme Hydrogen and Fuel Cell Technology (NIP) as well as the Electromobility Model Regions of the BMVBS.

The most important function of the NOW is the initiation, evaluation and bundling of projects. In addition cross-cutting themes such as production technologies, education and further training, communication at the interface of government and industry as well as active public relations all contribute to raising the profile of these technologies and their products. Representatives from politics, industry and science sit on NOW committees. The advisory board counsels the organisation regarding the implementation of the NIP, especially with regard to current

market demands. Participating partners bring their specific knowledge to the table and within the framework of an integrated process, work to formulate political goals, organise technological funding and prepare the market.

The concrete handling of the Federal Ministry's funding is undertaken by the project administrator Jülich (PtJ). Furthermore, as the adoption of clean and economically-sustainable technologies is a global challenge, the NOW also supports international collaborations. The International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE) involves governments around the world in these discussions. Germany chairs the IPHE for the period of 2010-2011, with the secretariat situated at the NOW offices.

»THE MOST IMPORTANT FUNCTION
OF THE NOW IS THE INITIATION,
EVALUATION AND BUNDLING OF
PROJECTS.«



Nationales Innovationsprogramm
Wasserstoff- und
Brennstoffzellentechnologie



Modellregionen
Elektromobilität

The NIP

Hydrogen and fuel cell technology will play an essential role in the future of mobility and energy supply. In order to guarantee the further development of these technologies, in 2006 government, industry and science began a strategic alliance called the National Innovation Programme Hydrogen and Fuel Cell Technology (NIP). NIP is intended to speed up the process of market preparation of products based on this future-oriented technology. The total budget of NIP invested over a period of ten years until 2016 amounts to €1.4 billion. The Federal Ministry of Transport, Building and Urban Development (BMVBS) and the Federal Ministry of Economics and Technology (BMWi, Bundesministerium für Wirtschaft und Technologie) provide half of this sum, while the other half is funded by participating industry.

Besides large-scale demonstration projects, NIP also focuses on research and development projects. The demonstration projects are grouped into comprehensive lighthouse projects and take place under real conditions. Project partners thus work together and more efficiently on issues and challenges which they otherwise would have to face alone and with considerable individual effort.

NIP is divided into three programme areas in order to advance in equal measure, numerous hydrogen and fuel cell technology product and application options, and to be able to address in a targeted way the market-specific challenges of market preparation. The particular programme areas are: »Transport and Hydrogen Infrastructure«, »Stationary Energy Supply«, and »Special Markets«. With an eye to series production of components, the explicit focus in all programme areas is on the strengthening of the supply industry.

Further information on the precise content of projects under NIP can be seen from page 34 onwards.

Electromobility Model Regions

The BMVBS Electromobility Model Regions Programme has the objective of promoting battery-electric mobility and developing it from a regional focus (clusters). This will position Germany as a lead market.

Electromobility is becoming increasingly more important and provides an economic and efficient alternative in the transport sector. The Federal Ministry of Transport, Building and Urban Development (BMVBS) is making €130 million available in the Electromobility Model Regions Programme for the targeted building and operation of an electromobility infrastructure. The funds come from the second economic stimulus package of the federal government. The programme should serve to anchor electromobility in the public sphere and develop it from selected model regions. NOW coordinates and manages its implementation in the eight model regions of Berlin/Potsdam, Bremen/Oldenburg, Hamburg, Munich, Rhine-Main, Rhine-Ruhr, Saxony and the region of Stuttgart. Vehicle fleets and relevant infrastructure that are easily visible to the public will be particularly promoted. Activities in the model regions are embedded in regional funding structures, and superordinate sustainability and transport strategies.

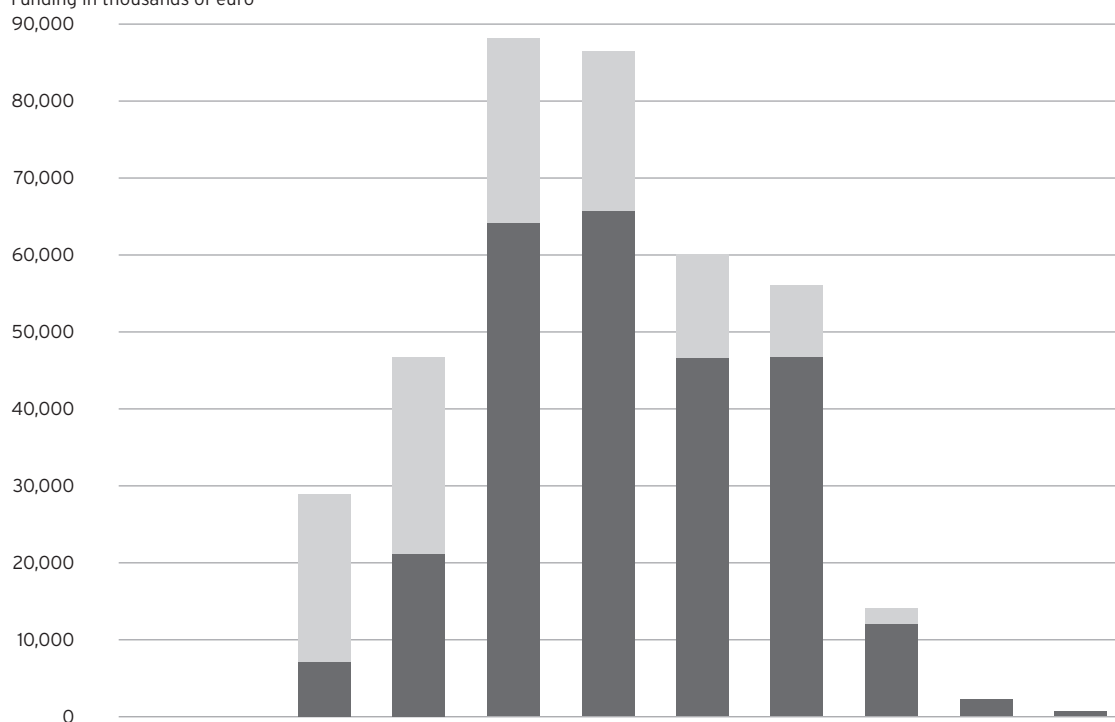
Further information on the programme and the eight model regions can be found from page 80 onwards.

In the financial planning of the BMVBS in 2010 funds amounting to 43.6 million euro were allocated to NIP. By the end of the year, 49.1 million euro were requested from project partners (the funding amount of projects which had granted status, LoI (Letter of Intent), applications being processed totalled 64.3 million euro). The difference between requested and actually released funds was financed from remaining expenditures from the previous year.



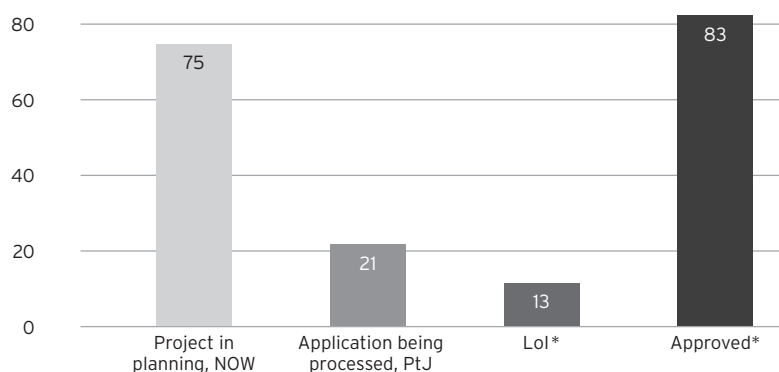
NIP – Source of funds Demonstration (BMVBS) and R&D (BMW i)

Funding in thousands of euro



	2008	2009	2010	2011	2012	2013	2014	2015	2016
BMWi approved	22,318	24,393	24,754	21,147	13,420	8,954	1,834		
BMVBS approved, Lol (Letter of Intent), application being processed by project administrator Jülich (PtJ)	7,171	21,620	64,302	65,967	46,779	46,568	12,815	2,685	0

NIP – Processing status (as at December 2010)



* 96 projects (216 individual applications) are approved, or there is a Letter of Intent (Lol) BMVBS funds

BMVBS funds

NIP application sectors (as at December 2010)

Programme area	Budget €k	Funding €k	In discussion €k	Approved, Lol, application being processed €k
Transport	423,150	203,351	33,581	169,771
H ₂ production	76,501	42,671	34,587	8,084
Stationary industry	130,352	62,409	35,640	26,769
Stationary household energy	107,411	51,691	15,713	35,978
Special markets	139,716	67,168	31,085	36,083
Cross-cutting themes	21,525	11,195	2,967	8,228
Total	898,655	438,486	153,573	284,913

BMVBS funds



WITHIN THE NIP, THE FEDERAL MINISTRY OF ECONOMICS AND TECHNOLOGY (BMWi) FUNDS PROJECTS WHICH FOCUS ON RESEARCH AND DEVELOPMENT

Research and development of hydrogen and fuel cell technology

BMWi concentrates on funding application-oriented research and development. Its funding thus comprises the entire application area of the technology: from transport and infrastructure, stationary fuel cells for household energy supply as well as for industrial applications, to special markets for fuel cell technology. With basic research-oriented projects of the BMBF (Federal Ministry of Education and Research) as well as demonstration projects of the BMVBS, support measures are closely coordinated with one another. This occurs mainly through the advisory board of the NOW.

Operational areas of the technology

While hydrogen, particularly in combination with fuel cells is seen as a promising transport fuel, stationary fuel cells are key components of sustainable energy supply, especially in decentralised electricity and heat generation. Despite considerable success in research and development measures taken thus far, many technological and economic obstacles need to be eliminated. Future funding projects focus therefore even more on reducing costs and increasing reliability and system lifespan.

Funding priorities

The 5th Energy Research Programme is the basis for BMWi funding measures in NIP. Funding priorities are established in the National Development Plan of NIP and

will be adapted according to the specifications of the advisory council of the NOW. Until the end of 2010, the development plan comprised the following funding priorities:

- **»Transport«**
Polymer Electrolyte Fuel Cells, peripheral components, drive technology, hydrogen electricity storage, hydrogen generation and infrastructure, Solid Oxide Fuel Cells (SOFCs) for onboard electricity supply in vehicles.
- **»Stationary applications in household energy supply«**
Reformation, low-temperature PEMFCs, high-temperature PEMFCs, SOFCs
- **»Stationary industrial applications«**
Molten Carbonate Fuel Cells (MCFCs) and SOFCs, components and subsystems, series production manufacturing methods
- **»Special markets for fuel cells«**
e.g. Emergency electricity supply, warehouse vehicles, onboard electricity supply for the leisure market

IN 2010 THE FOLLOWING BMWI NIP PROJECTS BEGAN:

Keyword

PEM Membranes

Commencement	Conclusion	Recipients	Project budget €	Funding budget €
01.07.10	30.06.13	Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V. (MPG)	206,000	99,000
		Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V. (MPG)	221,000	106,000

Keyword

PEM membranes from highly sulphonated polysulphones

Commencement	Conclusion	Recipients	Project budget €	Funding budget €
01.07.10	30.06.13	FuMA-Tech Gesellschaft für funktionelle Membranen und Anlagentechnologie mbH	705,000	346,000

Keyword

Reformer for methanol

Commencement	Conclusion	Recipients	Project budget €	Funding budget €
01.08.10	31.01.13	Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW)	558,000	558,000
01.08.10	31.01.13	Wieland-Werke AG	292,000	117,000
01.08.10	28.02.13	WS Reformer GmbH	107,000	43,000

Keyword

DMFC forklifts

Commencement	Conclusion	Recipients	Project budget €	Funding budget €
01.07.10	30.06.11	Forschungszentrum Jülich GmbH	584,000	584,000

Keyword

SOFC – APU

Commencement	Conclusion	Recipients	Project budget €	Funding budget €
01.01.10	30.09.12	Vaillant GmbH	9.861,000	4.733,000

Keyword

Small appliance programme

Commencement	Conclusion	Recipients	Project budget €	Funding budget €
01.05.10	30.04.11	Schmalenberger GmbH & Co. KG	132,000	66,000

Keyword

Household energy

Commencement	Conclusion	Recipients	Project budget €	Funding budget €
01.06.10	30.04.11	Zentrum für Brennstoffzellentechnik GmbH	772,000	772,000

»ONLY WITH A GLOBAL APPROACH CAN THE TECHNOLOGY BE COMMERCIALISED.«

International Collaboration

Because markets for most hydrogen and fuel cell applications are global, NOW strives to work closely together with other countries that are taking leadership roles in hydrogen and fuel cell research and commercialisation. It is clear that industry is acting on a worldwide basis, and therefore governmental organisations must also work together to coordinate a global approach. NOW works with international partners on both a bilateral and multilateral basis to advance the development of markets and technologies. By sharing information and lessons learned, we are able to leverage the experience of other programs around the world to achieve faster and more efficient advances in technology as well as develop innovative, effective, and coordinated approaches to commercialisation.

In working with our international partners, NOW facilitates collaboration in technical R&D as well as the exchange of information and experiences regarding programme management, policy, infrastructure development, and commercialisation strategies. It is our belief that a coordinated, worldwide approach to market development is needed to complement our domestic activities and realise the potential of hydrogen and fuel cell technologies on a large scale.

2010 Bilateral Activities

With strong industry and governmental leadership in several application areas, Japan is a world leader in hydrogen and fuel cell technologies. In May 2010, NOW strengthened our existing relationship with the Japanese programme by signing a Memorandum of Understanding for cooperative information exchange with NEDO (New Energy and Industrial Technology Development Organization), a government agency of the Ministry of Economy, Trade and Industry, and NOW's closest counterpart in Japan. Both organisations recognise that international collaboration is essential not only for further development of fuel cell and hydrogen technologies, but also for further promotion and commercialisation of fuel cell vehicles, hydrogen infrastructure, and stationary fuel cell systems. The MOU for cooperative information exchange will cover data related to FCVs, hydrogen infrastructure, and stationary FC systems, scenarios for commercialisation of these technologies, project management methodologies, and policy and technology trends. The MOU has already led to a series of meetings between NOW and NEDO leaders to discuss commercialisation timelines and issues, and high-level policy strategies.

NOW also works closely with partners in the United States. NOW staff participated in the U.S. Department of Energy's Fuel Cell Technologies Program's Annual Merit Review in June 2010, and works closely with programme leaders to exchange information on high-level analysis, programme planning, and codes and standards development. The Clean Energy Partnership lighthouse project continued its collaborative work with the California Fuel Cell Partnership by exchanging information and lessons learned, specifically in the area of bus refuelling.

Within Europe, NOW works closely with the Joint Undertaking for Fuel Cells and Hydrogen to align Germany's R&D and demonstration programs with those of the EU. NOW staff participated in the FCH JU's General Stakeholder Assembly in November 2010, and is working to identify specific opportunities for collaboration within existing projects in the coming year.

NOW also places importance on involving international stakeholders in our events - this year we welcomed contributors from the U.S., Norway, Denmark, France, the Netherlands, and several other countries as well as EU representatives at our Clean Mobility Insights conference in September 2010.

Multilateral Activities

Germany is currently serving as the Steering Committee Chair and Secretariat of the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE, www.iphe.net). The IPHE is a partnership of 17 countries plus the European Commission that are committed to accelerating the development of hydrogen and fuel cell technologies.

The IPHE structures its activities around its four strategic priorities as follows:

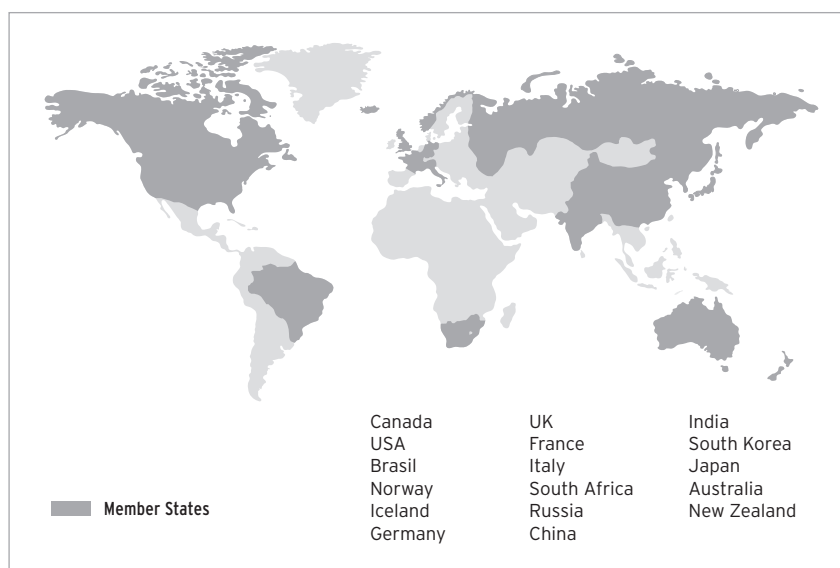
- Accelerating the market penetration and early adoption of hydrogen and fuel cell technologies and their supporting infrastructure
- Policy and regulatory actions to support widespread deployment
- Raising the profile with policy-makers and the public
- Monitoring hydrogen, fuel cell and complementary technology developments



Currently, the NOW-based IPHE Secretariat is working closely with IPHE partners to organise a series of workshops on various topics, administer the IPHE biennial awards programme and set up a virtual master course on hydrogen and fuel cell technology. The declared objective of these actions is exchanging knowledge and lessons learned and comparing member states' domestic developments and advancing them further. Under German Chairmanship, IPHE is aiming to prepare a special Steering Committee (SC) Meeting with stakeholders in late 2011. This is especially to draw political attention to the hydrogen and fuel cell-related activities of its member states and to make IPHE visible on a higher political level.

NOW is represented in the IPHE SC by representatives of the Federal Ministry of Transport, Building and Urban Development (BMVBS) and the Federal Ministry of Economics (BMWi). At working level (IPHE work groups and task

forces), NOW looks after Germany's interests jointly with the state of North Rhine-Westphalia. Germany is serving as the IPHE SC chair from 2010-2011. For this period the IPHE Secretariat is being hosted by NOW.



The following events and activities took place in 2010:

- Publication of »2010 Hydrogen and Fuel Cell Global Commercialization and Development Update«
- IPHE workshops:
 - February: Infrastructure, California
 - June: Governmental Programmes on Electric Mobility, Ulm
 - September: Demonstration, Shanghai

69 CAMPAIGN
PARTNERS

OVER
8,000
VISITORS

OVER
50
CAMPAIGNS
ACROSS
THE WHOLE OF
GERMANY



PUBLIC RELATIONS 2010

Changing energy - the campaign

16 February to 21 May 2010

Publicity for future technologies

»Changing energy - welcome to hydrogen and fuel cell country«: this was the motto under which from February to May 2010 across the whole of Germany, the hydrogen and fuel cell industry informed the public about key technologies of today and the future. Citizens, the media and politicians in all four corners of the country learned more about the importance of hydrogen and fuel cells for the environment, the economy and society as a whole.

The future starts now

How will the cars of tomorrow be driven? How does clean energy supply work in your own home? Are hydrogen-fuelled airplanes or fuel cell power units for mobile phones on the horizon? The variety of fields of application of hydrogen and fuel cell technologies in everyday use is impressive, but many people in Germany are not aware of this. The 100-day national communication campaign »Changing Energy« contributed to spreading awareness of technologies, which will soon become a natural part of our lives.

Experiencing the diversity of applications

Global players and medium-sized companies, start-ups, institutes, action groups and associations - 69 partners in all from industry, science and politics participated in »Changing Energy«. In over 50 campaigns in all parts of Germany, they opened their doors, presented products and technologies or gave visitors insight into their research findings.

The partner activities were the heart of the campaign. Different formats were used according to the target group: school days and exhibitions, a conference, different workshops and even a rally with hydrogen cars from Berlin to Hamburg. In total over 8,000 visitors could ex-

perience first-hand how hydrogen and fuel cell technology can be employed for everyday use.

Background

The »Changing Energy« campaign was created on the initiative of EnergyAgency.NRW (North Rhine-Westphalia) and NOW, and supported by the Federal Ministry of Transport, Building and Urban Development (BMVBS).





X

JANUARY

INTERNATIONAL EXPERTS

Bundled expertise: not yet opened but already in the spotlight, NOW and TOTAL discuss the status and fields of application of hydrogen and fuel cell technology with a Japanese delegation of top managers from companies and organisations like Nissan, Toyota and Nedo at a hydrogen refuelling station in Holzmarktstrasse in Berlin.



I-r: Dr. Frank-Michael Baumann, Managing Director of Energy-Agency.NRW; Rainer Bomba, State Secretary at the Federal Ministry of Transport, Building and Urban Development; Dr. Klaus Bonhoff, Managing Director (Chair), NOW GmbH

»CHANGING ENERGY« - CAMPAIGN LAUNCH IN BERLIN

Energy roundtable: with a press launch in the historic Gendarmenmarkt in the centre of Berlin, »Changing Energy« starts on the 16 February with a bang. Rainer Bomba, State Secretary at the Federal Ministry of Transport, Building and Urban Development, Dr. Klaus Bonhoff, Managing Director (Chair) of NOW GmbH (National Organisation Hydrogen and Fuel Cell Technology) and Dr. Frank-Michael Baumann, Managing Director of Energy-Agency.NRW make themselves available for an exchange of views and perspectives on hydrogen and fuel cell technology to press, radio and TV representatives.



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FEBRUARY

MARCH »

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WHAT WILL DRIVE US TOMORROW? HYDROGEN UNDER DISCUSSION

Talk: In the World Café around 80 participants from the areas of technology, politics and environment discuss their views on hydrogen technology. The event is organised by NOW, the Heinrich-Böll Stiftung and the NIP project HyTrust - hydrogen acceptance.



Rainer Bomba, State Secretary at the Federal Ministry of Transport, Building and Urban Development: »Clean and affordable mobility for all will only become a long-term reality when transport becomes less dependent on oil. Aside from batteries, hydrogen and fuel cells play a central role in the mobility and energy supply of tomorrow. German companies are world leaders in this regard. Already today, application-ready products such as cars, busses, ships or even heaters are in operation. We want to build on this position and reach the market threshold within this decade. To achieve this, we in Germany have put an excellent and highly successful programme of research and development of hydrogen and fuel cell technology into action. The federal government and industry are investing 1.4 billion euro until 2016. Germany is set to become the leading market for sustainable mobility and energy supply. This day shows us that we can achieve this goal.«



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MARCH

NIP general assembly

Success: in the atrium of the Federal Ministry of Transport, Building and Urban Development (BMVBS), the second general meeting of the National Innovation Programme Hydrogen and Fuel Cell Technology (NIP) takes place. Approximately 170 representatives from industry, politics and science take part in the event, listen to detailed presentations from different programme areas and inform themselves about the latest overall status of the programme. Conclusion: NIP is welcomed by industry in a big way. Two years after the programme launch, 39 percent of the approved funds of the 500 million euro of the BMVBS are already committed or are about to be approved. Industry in Germany is therefore fully committed to products from hydrogen and fuel cell technology.

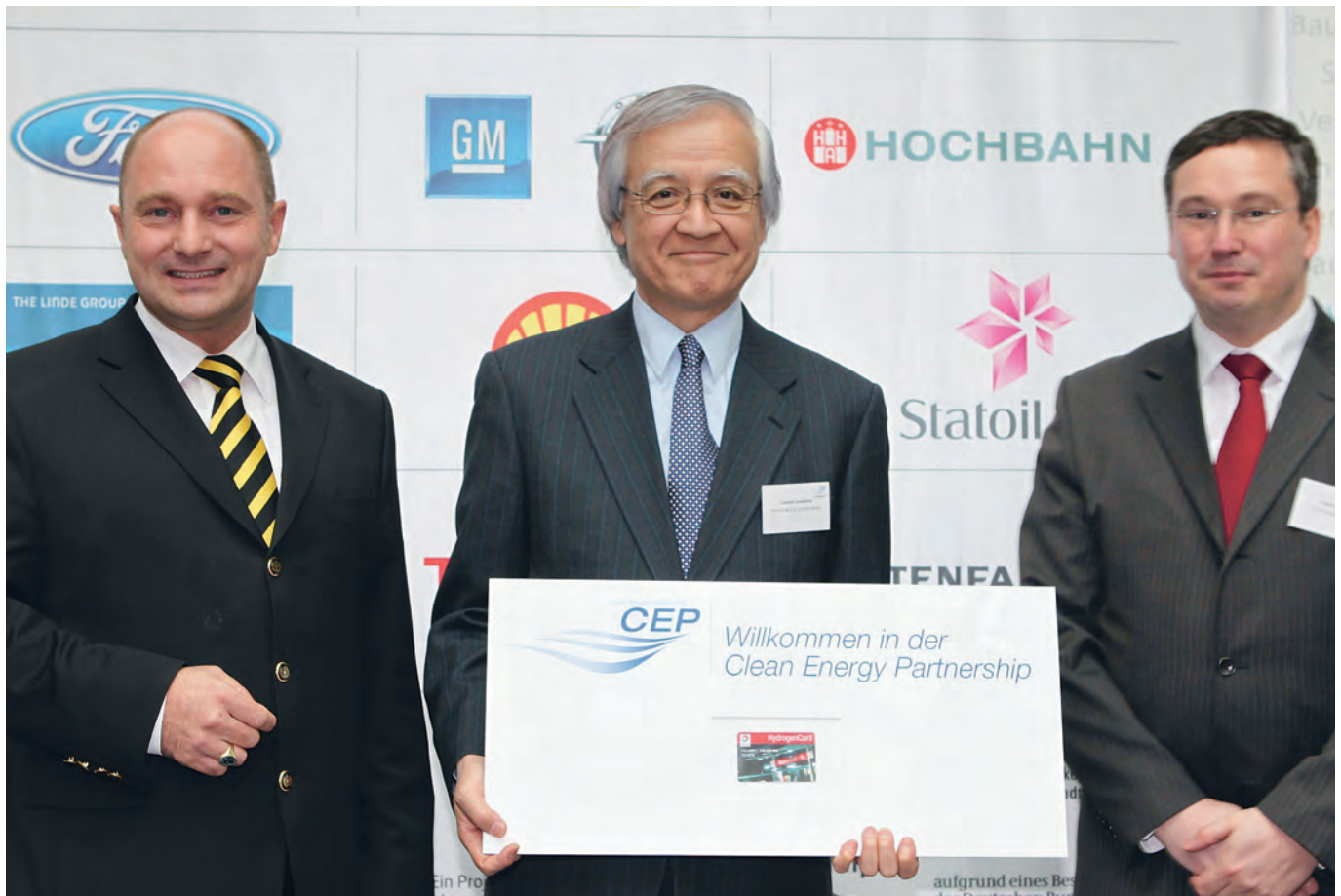


l-r: Dr. Heinz Baues, Ministry of Economics North Rhine-Westphalia; Hartmut Schneider, Federal Ministry of Economics and Technology; Rainer Bomba, State Secretary, BMVBS; Nilgün Parker, BMVBS



l-r: Prof. Dr. Detlef Stolten, Forschungszentrum Jülich GmbH (Jülich Research Centre); Dr. Georg Menzen, Federal Ministry of Economics and Technology





TOYOTA JOINS THE CEP

Reinforcement: the Clean Energy Partnership (CEP) gains another strong automobile partner with Toyota. As part of a press conference in the Federal Ministry of Transport, Building and Urban Development in Berlin, the announcement of Toyota's joining was officially made. Five Toyota fuel cell hybrid vehicles become part of the CEP fleet.

I-r: Rainer Bomba, State Secretary, BMVBS; Tadashi Arashima, CEO and President of Toyota Motor Europe; Patrick Schnell, Head of Sustainable Development/ New Energy, Total and CEP Chairman

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MARCH

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CHANGING ENERGY - WELCOME TO HYDROGEN AND FUEL CELL COUNTRY

Premiere: the world's first totally emission-free fuelling station is created by TOTAL, Enertrag and Berlin Brandenburg International Airport. The CO₂-free hydrogen will be generated from wind energy and used by the Berlin CEP fleet. As a next step, the project will be integrated into NIP. The fuelling station should be completed by 2012.

I-r: Prof. Dr. Rainer Schwarz, Spokesperson for Berlin airports; Harald Wolf, Berlin Senator for Economics, Technology and Women; Werner Diwald, Management Board ENERTRAG AG; Matthias Platzeck, Minister President of Brandenburg; Rainer Bomba, State Secretary, BMVBS; Hans-Christian Gützkow, Managing Director TOTAL Germany



FUKUOKA DELEGATION: JAPAN'S HYDROGEN PIONEERS

Visit: with a delegation of leaders from industry and the hydrogen sector, the Governor of the Japanese prefecture Fukuoka, Wataru Aso, visits NOW. Fukuoka is a pioneer when it comes to hydrogen: aside from numerous test and training centres, the prefecture is planning a hydrogen city and the building of a hydrogen highway.

I-r: Dr. Andreas Ziolk, Head of the North Rhine-Westphalia Fuel Cell and Hydrogen Network; Wataru Aso, Governor of the Fukuoka prefecture; Dr. Klaus Bonhoff, Managing Director (Chair) NOW GmbH; Tadashi Higashi, Head of Delegation, Managing Director, Nippon Steel Engineering Co., Ltd

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HANOVER FAIR

Contact: NOW is regularly represented as a contact partner for both experts and media at industry fairs and exhibitions. A highlight of the trade fair season is the hydrogen and fuel cell stand at the Hanover Fair.

Kai Klinder (right), CFO, Programme Manager Stationary Fuel Cells NOW GmbH, in conversation with a fair visitor

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APRIL



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TECHNOLOGY JOURNALISM FORUM, MUNICH

Press: Within the framework of the »Changing Energy« campaign, NOW and the Frankfurter Allgemeine Zeitung host a technology journalism forum in the Munich and Upper Bavaria Chamber of Crafts. Around 40 editors from specialist and key media ask what the future of electromobility and energy supply looks like, and experts are available to answer journalists' questions. Following the forum, a political podium discussion takes place, organised by NOW and H2Gate.

I-r: Sabine Nallinger, Munich town councillor; Prof. Dr. Werner Tillmetz, Management Board of the Centre for Solar Energy and Hydrogen Research; Anja Heyde, ZDF presenter; Dr. Jens Müller, Management Board/ COO SFC Smart Fuel Cell AG; Rainer Bomba, State Secretary, BMVBS; Dr. Klaus Bonhoff, Managing Director (Chair) NOW GmbH; Heinrich Traublinger, President of the Munich and Upper Bavaria Chamber of Crafts

World Hydrogen Conference: Essen is the centre of hydrogen technology. The 18th World Hydrogen Energy Conference (WHEC) takes place in this bustling city on the Ruhr river and draws many scientific and industry experts. Political decision-makers on the national, provincial and local levels are also there, recognising that hydrogen and fuel cell technology offers clean, efficient solutions for mobility and energy supply. In the context of the event North Rhine-Westphalia becomes a key centre for the development of hydrogen mobility, in addition to Berlin and Hamburg, joining the Clean Energy Partnership (CEP). The WHEC represents the end of the »Changing Energy« campaign, initiated by the NOW and the EnergyAgency.NRW. The NOW was represented at the fair through a large exhibition stand.

I-r: Dr. Klaus Bonhoff, Managing Director (Chair) NOW GmbH; Christa Thoben, Minister of Economic Affairs and Energy, North Rhine-Westphalia; Dr. Frank-Michael Baumann, Managing Director EnergyAgency.NRW



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MAY

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WHEC 2010 – Essen, capital city of hydrogen technology



WHEC 2010 – INTERNATIONAL COLLABORATION

NOW and Japan's New Energy and Industrial Technology Development Organisation (NEDO) sign a Memorandum of Understanding at the World Hydrogen Energy Conference, in which both agree upon a common information exchange.

Both organisations agree that international collaboration is not only necessary for the further advancement of hydrogen and fuel cell technology, but beyond this the promotion and commercialisation of fuel cell vehicles, hydrogen infrastructure and fuel cells in stationary energy supply is also essential.

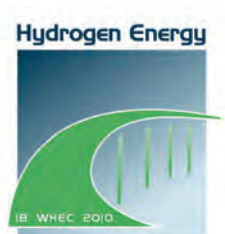
Dr. Sadao Wasaka, Executive Director NEDO; Dr. Klaus Bonhoff, Managing Director (Chair), NOW GmbH



OPENING OF HOLZMARKTSTRASSE

Launch: In Berlin's Holzmarktstrasse the second public hydrogen fuelling station is opened. TOTAL, Linde and Statoil were behind the construction of the NIP-funded station. The opening ceremony coincides with the beginning of the CEP rally with hydrogen-powered fuel cell vehicles. The rally is one of the high points of the »Changing Energy« campaign.

I-r: Maria Krautzberger, State Secretary, Senate Administration for Urban Development, Berlin; Patrick Schnell, TOTAL; Alexandra Bech-Gjörv; Sven Erik Svedmann, Norwegian Ambassador; Dr. Andreas Scheuer, BMVBS State Secretary



WHEC - YOUTH RESEARCH

Students from Bavaria, Baden-Württemberg, Rhineland-Palatinate and North Rhine-Westphalia are prize winners of the »Hydrogen and Fuel Cell« competition within the framework of »Youth Research«, awarded by the NOW. Prizewinners from around the world participate in a visit to the WHEC, and a tour of the Fuel Cell Research Centre (ZBT) gives the young researchers a deeper insight into the status of the technology.



WHEC - MINISTER RAMSAUER AT NOW

The Federal Minister of Transport, Building and Urban Development, Dr. Peter Ramsauer, brushes up on the current status of market preparation of products and applications from hydrogen and fuel cell technology at the NOW stand. The project status of the National Innovation Programme Hydrogen and Fuel Cell Technology (NIP) clearly shows that German industry is fully committed to hydrogen and fuel cell products.

Dr. Klaus Bonhoff, Managing Director (Chair) NOW GmbH, and Federal Minister Dr. Peter Ramsauer (CSU)



JUNE »

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BREMEN ON ITS MARKS

Project start: The electromobility model region of Bremen/Oldenburg is officially launched. In the Personal Mobility Center future scenarios relating to vehicle and mobility concepts are developed.

l-r: Enak Ferlemann, Parliamentary State Secretary at the Federal Ministry of Transport, Building and Urban Development; Martin Günthner, Senator for Economics and Ports Bremen; Prof. Dr.-Ing. Matthias Busse, Fraunhofer IFAM





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JULY

ROLLING MODEL REGIONS

Pioneers: A moped invasion takes place on 4 July in Stuttgart - in the Schlossplatz the largest German electric fleet, comprising 500 electric mopeds, are handed over to test customers. NOW and the project headquarters of the region of Stuttgart model region participate as part of a large city festival.



OPEN DAY AT THE TRANSPORT MINISTRY

Driving pleasure: German federal ministries invite citizens to take a tour. At the Transport Ministry, surrounding streets were of course also involved. Together with the CEP, NOW offers short spins in hydrogen vehicles, and interested guests can also test electric mopeds. The response is huge: the open days illustrate people's deep interest in future-oriented mobility concepts.

Dr. Andreas Scheuer, BMVBS State Secretary

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AUG SEPTEMBER »

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MINI, BUT NOT SMALL

Presentation: In the Munich model region 40 drivers are happily about to test their Mini E's. The BMW Group, Siemens and the Stadtwerke München (Munich public utilities) celebrate as part of a ceremony on the Odeonsplatz with political figures from federal, state and city level.

l-r: Dr. Kurt Mühlhäuser, Chairman of the Stadtwerke München; Dr. Klaus Bonhoff, Managing Director (Chair) NOW GmbH; Dr. Richard Hausmann, Head of Smart Grid, Siemens AG; Nina Bichelmaier, Mini E test driver; Dr. Klaus Draeger, Member of the Board, BMW AG; Christian Ude, Lord Mayor of Munich; Dr. Andreas Scheuer, BMVBS State Secretary



NOW Conference »Clean Mobility Insights« at Tempelhof airport

The future now: Electromobility is battery and fuel cells – under the auspices of Transport Minister Peter Ramsauer, the NOW together with partners from NIP as well as the model regions present the first comprehensive status reports. Special attention is paid to the theme of international exchange of knowledge, the current technology status as well as European exchange of experiences with respect to market preparation and introduction concepts. Renowned experts make presentations from all sectors. The Fuel Cells and Hydrogen Joint Undertaking and the European Hydrogen Association are conference partners. The two-day programme rounded off with a conference dinner and a Ride-and-Drive opportunity for conference-goers. With 230 participants from industry, science and politics, the booked-out event attracted a high-level of publicity.



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SEPTEMBER

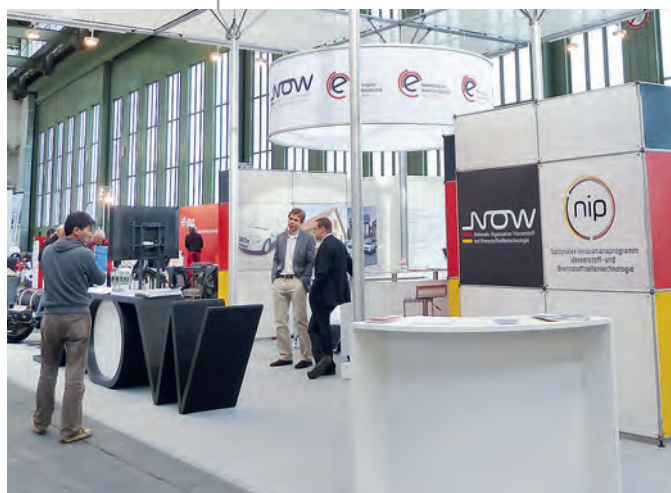




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Clean Tech World and the Clean Tech Media Award

Common exhibition stand: NOW is represented, together with the CEP and the eight model regions, at the first conference to be held in Berlin's Tempelhof airport. Aside from the opportunity to experience electromobile diversity, the event focuses on the best environmental technologies in Germany. The Clean Tech Media Award, for which Dr. Bonhoff is a jury member, takes place for the third time as part of the event.



F-CELL IN STUTTGART

First-hand information: At the NOW stand at the 2010 F-Cell event in Stuttgart numerous technical discussions take place.



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SEPT

OCT

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INITIATIVE CLEAN POWER NET

Network: Companies from all over Germany establish the Clean Power Net initiative in order to together advance efficient, intelligent and climate-friendly energy supply on the basis of fuel cells. Members come from IT, and the areas of telecommunications and traffic-control systems technology. In the uninterruptible electricity supply sector, fuel cell technology is already now particularly close to market. Clean Power Net is to become an NIP lighthouse project in the special markets programme area in 2011.

Wolfgang Axthammer, Programme Manager Special Markets, NOW GmbH



TECHNOLOGY JOURNALISM FORUM, HAMBURG

Hydrogen on the river Alster: Following the Munich forum, NOW hosts another journalist event with a workshop in the Hamburg Chamber of Crafts. Editors learn first-hand from experts what the current technological status of hydrogen is, and gain insight into the political relevance of the hydrogen issue for the Hanseatic City of Hamburg.



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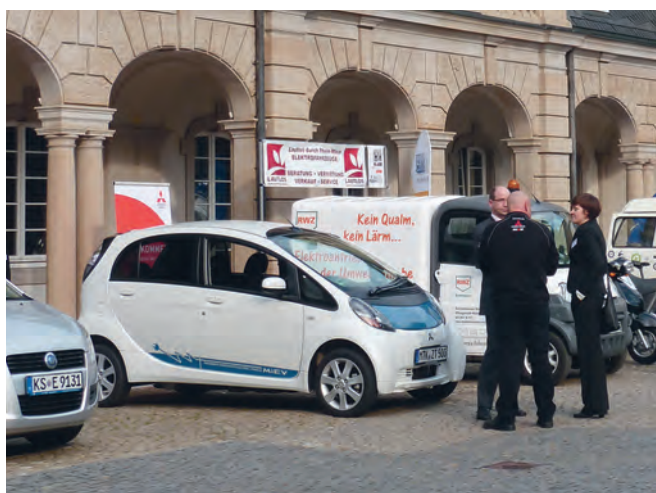
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FUEL CELL FORUM KASSEL

Technical discussion: On 6 October the fuel cell forum takes place in Kassel. NOW informs about stationary applications and has an exhibition stand.

FUTURE-ORIENTED ELECTROMOBILITY IN THE RHINE-MAIN MODEL REGION

Electromobile: With a kick-off event in Offenbach on the Main river, the Rhine-Main model region shows just how many applications can already become reality in the electromobility area. Alongside the vehicles, representatives from politics, business and trade associations also made their contribution. State Secretary Rainer Bomba is convinced of the benefits of electromobility and affirms, along with Hessen's Minister for Economy and Art, Eva Kühne-Hörmann, the goal of the Federal Government to bring one million electric vehicles onto German roads by 2020.



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BADEN-WURTTENBURG STRENGTHENS THE CEP

Partner: On 1 December 2010 the Minister of State Helmut Rau and the Baden-Württemberg Minister of the Environment and Transport Tanja Gönner announce that Baden-Württemberg is to join to CEP. By joining, the state deepens its commitment to the promotion of hydrogen and fuel cell technology and the area of electromobility.

l-r: Franz Loogen, Managing Director e-mobil BW; Prof. Herbert Kohler, Head of E-Drive and Future Mobility, Daimler AG; Tanja Gönner, Minister of the Environment and Transport, Baden-Württemberg; Dr. Hans-Josef Zimmer, Chief Technology Officer, EnBW AG; Helmut Rau, Minister of State Baden-Württemberg

DEC

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CLEANTECH MADE IN GERMANY – FACT-FINDING TRIP FOR INTERNATIONAL TRADE PRESS

Worldwide journalistic interest: Together with Germany Trade and Invest (GTai), NOW organises a fact-finding trip for international specialised journalists. Participants from the hydrogen, fuel cell and battery-electric mobility areas travel from the UK, Spain, the USA and Canada. Demonstration projects are visited in Berlin and Brandenburg.

Frankfurter Allgemeine

ZEITUNG FÜR DEUTSCHLAND

Contribution by Dr. Klaus Bonhoff, Managing Director (Chair)
NOW for the F.A.Z. supplement »Clean Tech«, 15.09.2010
(Translated from the original German)

The journey is the destination

Functioning transport on German roads is essential to secure our mobility needs. At the same time transport must be designed in as climate-friendly a way as possible.

By KLAUS BONHOFF

The transport sector consumes about a third of final energy in Germany and accounts for almost 20 percent of carbon dioxide emissions. Here the share of road traffic totals around 70 percent. By 2050, carbon dioxide emissions are to be decreased by 80 percent. This ambitious goal can only be reached with renewable energies and efficient drives which do not cause emissions harmful to the climate. Intensive collaboration of all participants and coordination of their activities is essential for the successful launch of these products onto the market.

Because of people's individual mobility needs, no one technology will fulfil the requirements of all customers. Rather a demand-oriented portfolio of drive systems and fuels will be established - from hybrid vehicles with varying levels of electrification to battery-electric drives as well as hydrogen and fuel cell vehicles. Fuel cell vehicles are especially suited to overland journeys because of their fast refuelling times and long range. Battery-electric drives in compact cars on the other hand, best develop their potential in urban transport. Alongside increasing efficiency of drive systems, renewable energies such as liquid hydrocarbons from biomass as well as electricity and hydrogen from regenerative sources in the transport area must be introduced. Moreover hydrogen provides a solution to the necessary intermediate storage of large amounts of energy in the context of the further development of renewable energies.

The Federal Government supports a holistic approach to electromobility. Thus the goal of the »National Innovation Programme Hydrogen and Fuel Cell Tech-

nology« (NIP) is to prepare the market for these technologies in the areas of transport, household and industry applications as well as special markets. Until 2016 NIP constitutes a ten-year strategic alliance between industry, science and several federal ministries. Including industry funds already made available, approximately 1.4 billion euro will be invested. From basic research to everyday testing, the development of electromobility with batteries will be funded with 500 million euro from 2009 to 2011 in the framework of the Federal Government's second economic stimulus package. Within this the Federal Ministry of Transport, Building and Urban Development is making 115 million euro available for the »Electromobility Model Regions Funding Programme«. This focuses on eight model regions in the areas of vehicles testing and infrastructure. A continuation of the programme of the current activities is now being discussed: the goal is to establish Germany as a leading market for electromobility.

The German transport sector has traditionally been of great importance in terms of industrial policy as well as national economy policy. To sustainably strengthen the economic aspect in the long-term, market leadership must be developed with new, efficient drive systems on an international level. However, only the trio of politics, industry and science can provide a successful value chain. Currently a gap still exists between research and development and market introduction. In addition to testing the technologies in everyday conditions, participants are working on overarching policy issues in order to appropriately prepare the market. These include safety aspects, uniform standards, interfaces between stationary energy supply and transport, new market models or legal frameworks. Last but not least, the necessary public support for a technologically-open market introduction also requires acceptance among the people.



Such a sight seldom occurs - the downside of individual mobility is that more and more people are surging onto the roads.

The ongoing programmes and activities target sustainable mobility with a broad spectrum of renewable energies, whereas every drive technology gets its own special space to develop. If all players pull together, emission-free mobility can become a reality. Customer needs, market demands and environmental goals - reflected in technological potential - must be optimally coordinated. An entire integrated programme which incorporates energy supply and the transport sector in equal measure is required for this purpose. Innovations successfully brought to market form the basis for global competitiveness both today and for the future. In this way the climate, the national economy and not least citizens, all continue to benefit at the same time over the longer term.

**Dr. Klaus Bonhoff, Managing Director (Chair) NOW GmbH
(National Organisation Hydrogen and Fuel Cell Technology), Berlin**

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P. 16: TOTAL Germany GmbH

P. 17 above: NOW GmbH, below: HYTrust/The Independent Institute for Environmental Issues

P. 18/19: NOW GmbH

P. 20 above: Clean Energy Partnership (CEP), below: TOTAL Germany GmbH

P. 21: NOW GmbH

P. 22 above: NOW GmbH, below: Clean Energy Partnership (CEP)

P. 23 above: NOW GmbH, below: Bremen/Oldenburg Electromobility Model Region

P. 24 above: EnBW AG

P. 25 above: NOW GmbH, below: BMW AG

P. 26 above: NOW GmbH, below: Clean Energy Partnership (CEP)

P. 27 NOW GmbH

P. 28: NOW GmbH

P. 29 left: NOW GmbH, right: State Ministry of Baden-Wurttemberg

P. 31: iStockphoto

THE PROGRAMMES

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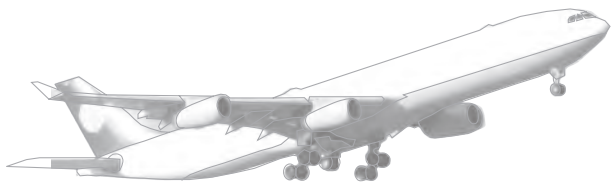
BMVBS Programme

ELECTROMOBILITY
MODEL REGIONS

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TRANSPORT AND INFRASTRUCTURE





»OUR GOAL: LOWER EMISSIONS AND HIGHER EFFICIENCY«

Thorsten Herbert, NOW Programme Manager Transport

Together for the environment

Approximately 2.5 billion cars are expected to be on the road worldwide by 2050. Europe alone can expect an increase of up to 273 million - that's according to the forecasts of leading companies in industry and institutions. In view of environmentally-damaging greenhouse gas emissions, these are dramatic numbers. Dr. Klaus Bonhoff, NOW Managing Director (Chair), explains the need for action: »As a society we still have to master some challenges in order to meet our responsibility toward future generations. But we are already moving in the right direction«. Only concerted cooperation on the part of all actors will provide the guarantee for sustainable success in environmental issues. NOW brings these different elements together and oversees the activities, projects and interests of individual players.

Harmonisation of challenges

To reduce CO₂ emissions by 80% in the coming decades the whole transport sector must contribute, because without the use of renewable energy and the deployment of efficient and environmentally-friendly drive technologies, this specified climate target cannot be reached. »The development of transport and infrastructure must be harmonised both chronologically and technologically«, explains Thorsten Herbert, NOW Programme Manager Transport. »Our goals are lower emissions and higher efficiency - for this purpose we believe in fuel cell technology with hydrogen as a fuel and battery electric drives. In addition to alternative drives and fuels, the appropriate infrastructure must be constructed. That means aside from a sufficient number of hydrogen fuelling stations, hydrogen will be increasingly sourced from renewable energy. The series deployment of fuel cell vehicles is expected by the year 2015. Car manufacturers, suppliers, energy suppliers and politicians are pooling their strengths. The 'Clean Energy

Partnership' initiative is an example of a joint demonstration project for the market preparation of technologies and for the generation of publicity to create acceptance among people. The »H2 Mobility« initiative even goes a step further and discusses a common business plan for the erection of a hydrogen infrastructure.

Advances such as the synchronisation of vehicle and fuelling station innovations can only be made together: by means of pressure refuelling of around 700 bars, fuel cell cars in everyday use can now be filled up in three minutes with approximately five kilogrammes of gaseous hydrogen. The simple and fast refuelling process as well as improved ranges of vehicles thus match the comfort of conventional cars.

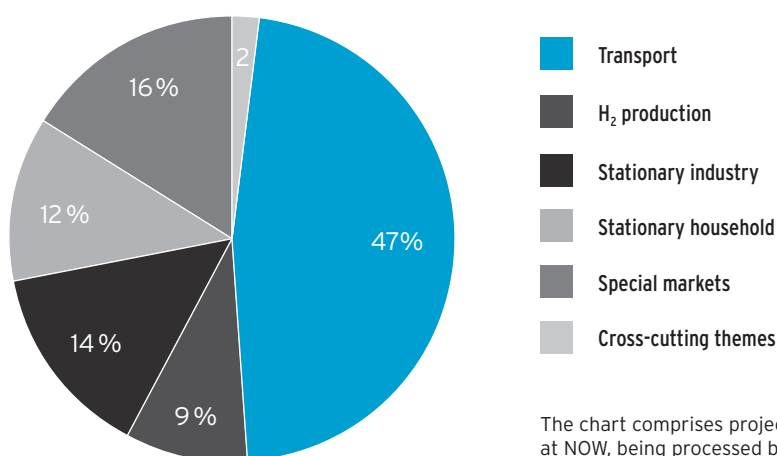
Global agreements

In Germany today there are approximately 30 public and private hydrogen fuelling stations. In the framework of the CEP a further 10 stations and corridors between cities and regions will be created by the end of 2012 alone. A stated aim is to exceed the 50 percent target for renewably-generated hydrogen within the next five years. Less visible however, are the numerous innovative technologies which are behind sustainable methods of production for hydrogen. Dr. Oliver Ehret, NOW Programme Manager Hydrogen Infrastructure explains: »From 2020, the future of hydrogen production will lie in wind energy and biomass. With our partners we are currently developing new projects where attention is focused on combined applications of hydrogen in industrial manufacturing processes, as a storage medium and of course in road transport.«

From a global perspective, Germany constitutes the nucleus of hydrogen technologies - politics, industry and

NIP Statistic:

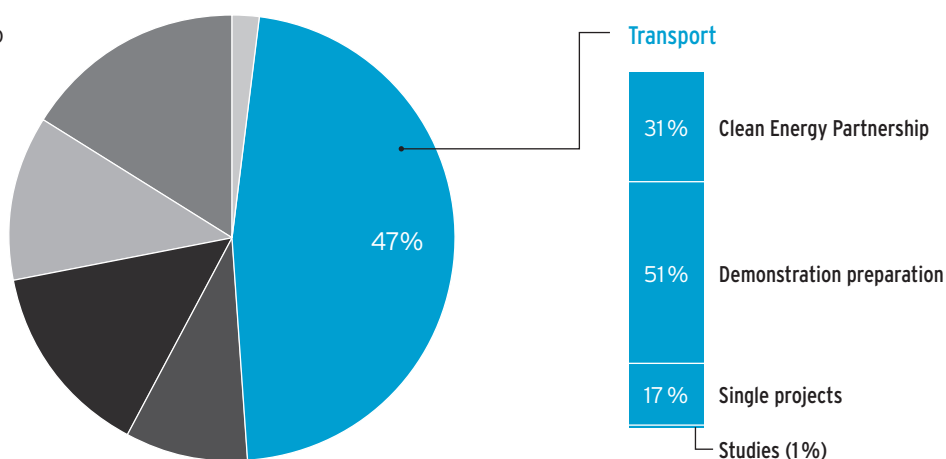
Share according to application sector
As at December 2010



The chart comprises projects at planning stage at NOW, being processed by PtJ, LoI (Letter of Intent) as well as approved projects.

Transport Programme Area:

Allocation according to application area
As at December 2010



science all agree. In a current European study, the automotive industry, suppliers, energy companies, politics and organisations define Germany as a launch market for a comprehensive hydrogen infrastructure. The experience gained – such as market and customer behaviour risk assessments or technological aspects – should help to rapidly expand the H₂ fuelling station network for new drive technologies within Europe. Synchronisation of technologies, production factors and market demands will simultaneously increase the value creation: Germany will in future be able to gradually export its know-how and individual market concept worldwide.

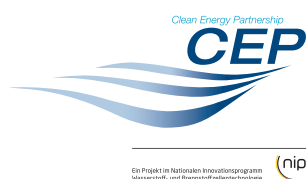
CLEAN ENERGY PARTNERSHIP (CEP)



 CEP REGIONS

Duration Phase II
2008-2010

Total project amount
58.3 million euro



DAIMLER



VOLKSWAGEN
AKTIENGESELLSCHAFT



TOYOTA

INTO THE FUTURE WITH STEAM

The Clean Energy Partnership (CEP) is one of the largest demonstration projects of hydrogen technology worldwide. Since 2002 CEP partners together implement successful projects on the road to future clean mobility. Their fuel cell vehicles have already surpassed the million mark in everyday use, covering a distance of exactly 1,010,773 kilometres. As an established network of companies from industry supported by politics, the CEP has been the light-house project of the National Innovation Programme Hydrogen and Fuel Cell Technology (NIP) in the transport area since 2008. NOW coordinates the many forward-looking activities of partners [GM/Opel](#), [Berliner Verkehrsbetriebe](#), [BMW](#), [Daimler](#), [Ford](#), [Hamburger Hochbahn](#), [Linde](#), [Shell](#), [Statoil](#), [TOTAL](#), [Toyota](#), [Vattenfall](#) and [Volkswagen](#).

Interim goals

»The interim results from the CEP are revealing«, says Thorsten Herbert, NOW Programme Manager, Transport. »From the continuous use of more powerful fuel cell vehicles and refuelling them through the sustainable generation, transport and storage of hydrogen, to the integration of renewable energy sources for hydrogen production, the partners have gathered valuable experience.«

The CEP timeframe is divided into three intensive work phases: initially two public refuelling stations were erected for 17 hydrogen vehicles by 2008 in Berlin. During the first phase the initiative tested a wide range of hydrogen applications and proved the reliability of individual technologies. In the second phase until the end of 2010, the partners validated the new technologies under everyday conditions and developed them further with a view to their marketability. For this purpose the number of passenger cars was increased to around 50 vehicles. In addition busses with hydrogen combustion engines as well as fuel cell hybrid busses from Daimler were added. They transport passengers on public transport with improved hydrogen infrastructure in the key regions of Berlin and Hamburg. Since May 2010 the CEP is active also in North Rhine-Westphalia. In December 2010 Baden-Württemberg also joined. Finally the third CEP phase will take place until 2016 and will focus on market preparation.

Fast fleets

Fuel cell vehicles are very quiet and produce no CO₂ emissions. In a chemical process the hydrogen and oxygen react to produce electricity for the engine; by-products are heat and steam. CEP car manufacturers can by now offer ranges of up to 450 kilometres with a full tank. Following the Mercedes-Benz A-Class F-CELL, Daimler deployed approximately 60 latest generation B-Class F-CELLs. Three fuel cell Ford Focus vehicles are being used by Berlin's city cleaning companies and Hermes Logistics Group. GM/Opel is driving ten HydroGen4s for various everyday purposes: in city transport for Allianz and Hilton as well as

long-range journeys for ADAC. Volkswagen is testing two VW Tiguan HyMotions, two Caddy Maxi HyMotions and two Audi Q5 HFCs. From 2011, the new CEP partner Toyota wants to increase its fleet from two to five FCHV-adv (advanced fuel cell hybrid vehicle) on the basis of the Highlander. In contrast, BMW is focusing on the combined technology of a hydrogen combustion engine, which in addition to hydrogen, can also be run on petrol. 2 BMW Hydrogen 7s complete the CEP fleet.

Everyday refuelling

Customers obtain environmentally-friendly fuel at public CEP refuelling stations. Depending on the vehicle's technology, they can acquire it either in liquid or in gas form under a pressure of 350 to 700 bars with only a three minute fuelling time. The highest-turnover hydrogen fuelling station is in Heerstrasse in Berlin, operated by TOTAL. The gaseous hydrogen will in future be produced from wind energy by electrolysis and delivered by trailer. In the fuelling station opened in 2010 by TOTAL in cooperation with Statoil and Linde in Holzstrasse at Berlin's Eastern train station (Ostbahnhof), the gaseous hydrogen is even generated electrolytically on-site. State-of-the-art compressors ensure the required pressure and control both storage and fuelling. In Hamburg, Vattenfall will supply its customers using the largest hydrogen station in Europe from 2011. Its capacity should in the future amount to approximately 780 kilogrammes of hydrogen per day, enabling about 20 line service busses and numerous passenger cars to be refuelled. For convenience, Linde is running a mobile hydrogen refuelling facility with a capacity of 160 kilogrammes of hydrogen. Further CEP fuelling stations are currently planned.

Final steps towards the future

Hydrogen mobility in the key regions of Berlin and Hamburg is the first success project of its kind in Europe. Thus the hydrogen infrastructure will be further extended in Germany as well as expanded to Scandinavia until 2016 with the help of the 'H₂ Mobility' initiative. At the same time the CEP partners want to produce large series of fuel cell vehicles. Essential decreases in costs for vehicles and infrastructure are as much on the agenda as the sustainability of hydrogen in a cross-regional product portfolio. »The CEP sets the standard as an international model«, says Mr. Herbert. »We are on the best path to establishing hydrogen as the fuel of the future and the Federal Republic of Germany as the leading market for hydrogen mobility.«

01 NIP – TRANSPORT- AND HYDROGEN INFRASTRUCTURE

Keyword

CEP Phase II Holzmarktstrasse

Commencement	Conclusion	Recipients	Project budget €	Subsidy amount €
01.01.09	31.12.13	TOTAL Deutschland GmbH	3,025,537	1.452,258
		Linde AG	218,770	105,010
		Statoil ASA	5,302,781	2,545,335

Hydrogen (H₂) is provided in both liquid (LH₂) and gaseous (GH₂) form pressurised to 350 and 700 bars at the Holzmarktstrasse TOTAL service station in Berlin. The facility is thereby ideally equipped to supply cars and busses tested within the CEP. Statoil produces the GH₂ on location via electrolysis. As planned, only green-certified power from renewable sources is used. The newly-developed electrolyser features extremely fast start up and shut down capabilities, allowing it to react swiftly to the specific performance profiles of wind power plants. Statoil also developed the refuelling system for GH₂, including the underground storage tanks. H₂ is being stored at high pressure (up to 1000 bars) here for the first time underground, thereby saving space. The refuelling system communicates with both

the storage facility and the vehicle's tank to deliver the required pressure. Linde provides LH₂ from the H₂ liquefaction plant in Leuna, Germany. The supplied H₂ is stored without after-cooling in a super-insulated tank developed by Linde. Refuelling is conducted via a fully-automated coupling with mechanical handling aid. A technical highlight of the plant is a mini combined heat and power unit that utilises the surplus gaseous hydrogen to supply the service station with heat and energy. An on-site photovoltaic system delivers further energy. TOTAL is the supplier of both the LH₂ infrastructure and the combined heat and power unit.

02 NIP – SERVICE STATION FOR HYDROGEN CARS

Keyword

CEP Phase II

Commencement	Conclusion
01.07.08	31.01.11
Recipients	
Adam Opel AG	
Project budget €	Subsidy amount €
135,378	64,982

As a mobility partner of the CEP in the framework of this project module, Opel/GM received in 2010 subsidies in order to continue and expand fuelling stations for hydrogen cars built in the operation of phase I of the project.

03 NIP – HYDROGEN BUSES

Keyword

CEP Phase II

Commencement	Conclusion
01.02.10	31.01.15
Recipients	
Berliner Verkehrsbetriebe (BVG)	
Project budget €	Subsidy amount €
3,267,123	1,568,219

Long-term testing of 4 buses with hydrogen combustion engines as well as further operation of a workshop designed especially for the maintenance and repair of hydrogen buses.

04 NIP – FUEL CELL HYBRID VEHICLES (FCHVS) IN EVERYDAY USE IN GERMANY

Keyword				
Test operation				
Commencement	Conclusion	Recipients	Project budget €	Subsidy amount €
01.03.10	31.12.10	Toyota Motor Europe N/V S/A	208,067	99,872
Keyword				
CEP II				
Commencement	Conclusion	Recipients	Project budget €	Subsidy amount €
01.02.10	31.01.11	Toyota Motor Europe N/V S/A	119,774	57,491

As partner of the Clean Energy Partnership (CEP), Toyota is convinced that there is not just one single ideal method for developing drive technologies of the future. That is why the company has taken a broad development approach over the last decade, which has incorporated fuel cell hybrid vehicles. The key technical components of these are based on the hybrid building blocks that the company has developed over the past years.

Toyota has been working on fuel cell vehicles since 1992 and released its first production vehicle, which was based on an SUV, in 2002. The Toyota FCHV was leased to selected customers in small numbers. The second generation of this vehicle, the FCHV adv, obtained approval for use on Japan's roads in 2008.

Toyota is currently deploying two FCHV adv vehicles in the CEP fleet and is testing these under everyday conditions - especially with a view to climatic conditions that prevail in central Europe.

The current generation of these fuel cell vehicles incorporates tanks designed to withstand a pressure of 700 bars. The application of this technology enables vehicles to reach a range of up to approximately 700km on a single tank. Further optimisation of this technology and an improvement of the vehicle-fuelling station interface are important factors for the market introduction of these vehicles and belong just as much to the project aims as examining how customers take to this type of refuelling technology.

FUEL CELL VEHICLES

05 NIP – DEVELOPMENT OF AN OPTIMISED HYDROGEN STORAGE SYSTEM FOR THE COMMERCIALISATION OF FUEL CELL VEHICLES

Hydrogen Storage Systems (HSS) have until now, only been developed for a small number of demonstration vehicles. With a view to future systems, this project will serve to facilitate the lean development of high functional integration with minimised assemblies and fewer interfaces, on the basis of the experience gained thus far. It aims to enhance quality, durability and reliability while simultaneously decreasing system weight and significantly lowering costs.

Alternative materials and production processes, a lean HSS/ vehicle integration concept along with a production-oriented design are further factors on the path to

commercialisation of fuel cell vehicles in greater numbers.

Besides the base analysis and pre-dimensioning of the HSS, further phases of work include concept development and evaluation of vehicle integration, high-pressure lines and connecting elements, the carrier system, as well as the refuelling interface including the construction and trial of test items. A comprehensive testing and validation programme will facilitate the provision of data for the overall HSS concept leading to a design suitable for mass production implementation.

Keyword	
Hydrogen storage system	
Commencement	Conclusion
01.06.10	31.12.11
Recipients	
Adam Opel AG	
Project budget €	Subsidy amount €
2,062,500	990,000

06 NIP – SYSTEM DEVELOPMENT AND VALIDATION OF A SECOND-GENERATION FUEL CELL DRIVE FOR COMMERCIAL VEHICLE APPLICATIONS

Keyword

FCPSGEN2

Commencement

01.06.10

Conclusion

31.12.10

Recipients

Adam Opel AG

Project budget €

2,062,500

Subsidy amount €

990,000

General Motors and its subsidiary Opel have invested over one billion euro into fuel cell research and development to date. 250 patents and far-reaching inroads for the preparation of fuel cell technology in automobiles are just a sample of the results achieved to date.

This project aims to develop and validate a pre-production series of fuel cell drives that includes all sub-systems and is incorporated in a test vehicle that will form the basis for small-scale production. Special focus will be placed on efficiency and costs as well as durability and reliability to pave the way towards mass production. From research and development to system validation, the drive system will

deliver valuable insights and essential data detailing the prerequisites necessary for commencing mass production of fuel cell vehicles.

This production programme is a further step towards achieving automobile production runs of several hundreds of thousands of units which will lead to the reduction of costs to levels comparable with those of vehicles featuring conventional drives.

07 NIP – EXPANSION OF »OPEL HYDROGEN4« HYDROGEN-FUEL CELL VEHICLE OPERATION TO NORTH RHINE-WESTPHALIA

Keyword

HydroGen4

Commencement

01.06.10

Conclusion

31.12.12

Recipients

Adam Opel AG

Project budget €

4,511,843

Subsidy amount €

2,165,685

The Clean Energy Partnership (CEP) is the European lighthouse project for the demonstration of hydrogen technology and fuel cell vehicles. In phase 1 of this project, Adam Opel AG participated with an »Opel HydroGen3« fuel cell vehicle and an »Opel HydroGen4« in phase 2 – both phases taking place in Berlin. Various customers tested the vehicles under everyday conditions.

Adam Opel AG will now deploy further fuel cell vehicles in North Rhine-Westphalia within the framework of the CEP location expansion. As in Berlin, various customers will use the vehicles. An Opel dealership in Dusseldorf will serve as the point of call

for vehicle deliveries and will also conduct basic servicing work. Air Liquide will construct a hydrogen refuelling facility at a TOTAL service station in Dusseldorf that Opel customers can use until the end of 2012. An analysis of vehicle data together with customer accounts of their experiences will provide valuable information that will feed into the development of future fuel cell vehicle generations to facilitate further improvements and optimisation.

DRIVE ALTERNATIVES OF THE HIGHEST EFFICIENCY

Fuel cells in the automotive sector provide a local emission-free drive alternative with maximum efficiency. In contrast to battery-electric drives, this technology can simultaneously deliver both the range and refuelling times found in vehicles with conventional drives, yet with zero emissions. Fuel cell vehicles can therefore make a decisive contribution to what is regarded as one of the greatest challenges for the future of individual mobility: a reduction in the emission of greenhouse gasses and other pollutants in a market that continues to grow.

In order to comprehensively develop the so-called lighthouse region of Hamburg along with those of other German cities – which includes taking the associated hydrogen production needs, refuelling infrastructure as well as the servicing of

the vehicles and refuelling facilities into account – the relevant industry partners have founded the Clean Energy Partnership (CEP) in association with the involved German Federal States. The National Innovation Programme Hydrogen and Fuel Cell Technology (NIP) plays a decisive role through targeted promotion to help establish this key future technology and develop a functioning market. 2011 will see the Mercedes-Benz B-Class F-CELL, whose manufacture commenced in 2010, be handed over to selected customers in Hamburg and other German cities for demonstration and testing purposes in regular daily operation. The delivery of these vehicles by Daimler AG in Hamburg promotes fuel cell mobility in this lighthouse region and ensures it remains an important part of the CEP's fuel cell vehicle fleet in Europe.

Keyword

F-Cell Hamburg

Commencement	Conclusion
01.05.09	31.12.10

Recipients
Daimler AG

Project budget €	Subsidy amount €
633,591	295,000

COMFORT

Keyword

CryoSys

Commencement	Conclusion	Recipients	Project budget €	Subsidy amount €
01.09.09	31.08.11	Bayerische Motoren Werke AG	2,683,445	1,288,054
01.09.09	31.08.11	Karlsruher Institut für Technologie (KIT)	1,933,777	928,213
01.09.09	31.08.11	Airbus Operations GmbH	515,947	247,655
01.09.09	30.09.11	ET EnergieTechnologie GmbH	176,741	84,836

In an era of depleting fossil fuel supplies and climate change, efforts are being stepped up across the globe to make renewable energy usable and mobility emission-free. Hydrogen as a fuel source promises high systemic storage density and fast refuelling. A challenge that hydrogen technology has yet to overcome satisfactorily is that of storage in the vehicle. The concept of cryo-compressed hydrogen storage is however, making advances in terms of storage density, safety and costs. The aim of the joint CryoSys project is to prove the suitability of cryo-compressed hydrogen fuel tanks for use in vehicles in addition to an analysis of their suitability for application in aviation. Within the framework of the project, investigations will be conducted that include fire and vacuum rupturing tests and

an evaluation of energy release following sudden tank failure as well as examining operational stability and various other functions. The inventor of the cryo-compression technology, BMW, has been able to secure partners for the consortium that boast great expertise in the field of hydrogen technology.

Among them is ET EnergieTechnologie GmbH, specialised in conducting tests on complete tank systems, the Karlsruher Institut für Technologie (Karlsruhe Institute of Technology) expert in the simulation and experimental validation of safety-critical hydrogen subjects, as well as Airbus Operations GmbH as the partner for the assessment of aviation applications.

10 NIP – NATIONAL VALUE CHAIN FOR HYDROGEN COMPONENTS DESIGNED FOR FUEL CELL SYSTEMS

Keyword

HY 4-Anode

Commencement

01.04.10

Conclusion

31.12.10

Recipients

NuCellSys GmbH

Project budget €

2,083,333

Subsidy amount €

1,000,000

Rising global energy usage, increasing pollutant emissions and a finite supply of fossil fuels are strong arguments for the promotion of low emission or emission-free energy sources. The fuel cell counts among the most promising sustainable alternatives for an efficient and environmentally-friendly method of producing electrical energy. That is why it is all but predestined for use in automobiles.

As a global leader in the development and production of fuel cell systems, NuCellSys endeavours to address the demands for pollutant-free, sustainable mobility. As part of the »National Value Chain for Hydrogen Components Designed for Fuel Cell Systems / NIP-Anode« project, NuCellSys is pursuing the goal of developing anode

and hydrogen circulation components for the next generation of fuel cell systems. Among the main aims is the simplification of the implemented technology to allow cost targets that will help promote commercialisation. The vast majority of components will be developed in conjunction with suppliers, up to the point of being ready for series production. The implementation of new materials, optimised production processes and verification of the developed components in the overall system at NuCellSys will additionally lead to shorter development cycles and thereby reduce costs. Furthermore, a value-added chain and supplier base is to be established to foster serial production procedures that are suitable for the automotive industry.

SERIES MATURITY

11 NIP – HEAVY-DUTY FUEL CELL SYSTEM OF THE 3RD GENERATION FOR APPLICATION IN BUSES/ NABUZ PRE-COMMERCIAL

Keyword

Heavy-duty fuel cell systems

Commencement

01.09.09

Conclusion

31.12.10

Recipients

NuCellSys GmbH

Project budget €

2,062,500

Subsidy amount €

990,000

01.09.09

31.12.12

EvoBus GmbH

554,643

266,229

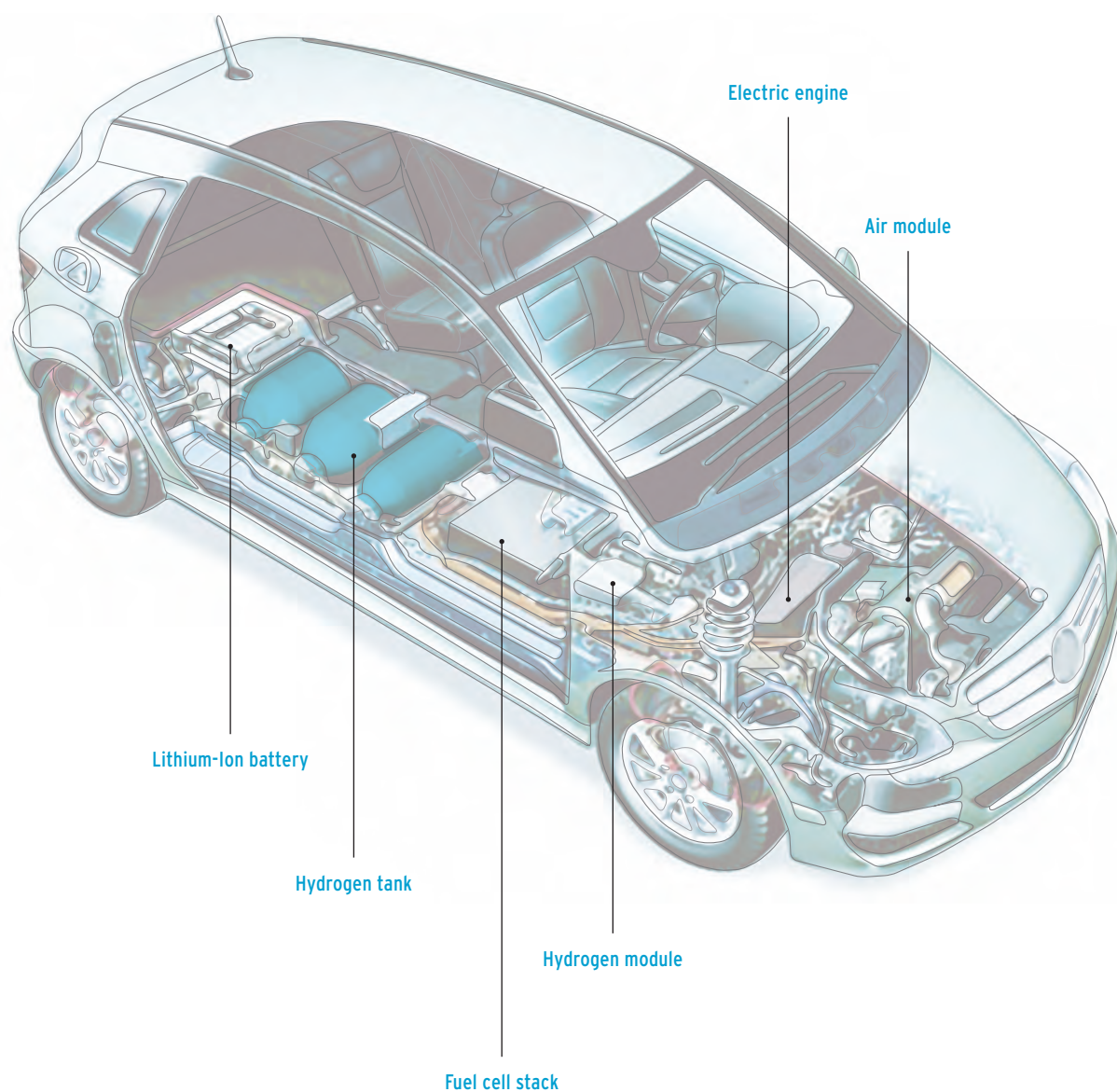
The finite supply of fossil fuels is in stark contrast to the rising global demand for energy. The projected annual growth in road transport and the resulting increase in pollutant emissions such as NO_x, soot particles and the greenhouse gas CO₂, require a swift move towards vehicles with low or zero emissions. The implementation of fuel cells as an efficient and environmentally-friendly fuel source take these demands into account – as has been impressively shown in previous local public transport demonstrations with hydrogen-run fuel cell buses.

As part of the overall NaBuZ project (Nachhaltige Bussysteme der Zukunft or Sustainable Bus System of the Future), NuCellSys and EvoBus are pursuing the common goal of utilising an automobile fuel cell of the next generation in the form of a so-called double system to thereby demonstrate its potential for application as a mass production fuel cell drive train for city

buses. Building on the operational strategy of a single system, the combination of two fuel cell systems into a double system requires the focused development of a specific operational strategy that adapts important components to the higher voltage level and increased life-cycle demands.

All project results will be used two-fold: On the one hand, for the development of subsequent, more efficient fuel cell system generations. On the other, they will directly find their way into the vehicle development of city buses with fuel cell drives. In this way, the commercial exploitation of project results can be achieved through the ensuing sale of such vehicles.

FUTURE TECHNOLOGY IN DETAIL



12 NIP - H2 REFERENCE MEASURING SYSTEM TO 70MPA

Keyword

H₂ Reference Measuring System

Commencement

01.08.09

Conclusion

31.05.11

Recipients

Linde AG

Project budget €

204,300

Subsidy amount €

98,064

To enable commercially run hydrogen refuelling stations to account for the exact quantity tanked by customers, it is essential that the measuring system at the pumps is precisely calibrated, tested and certified. The aim of the project is to develop and implement a hydrogen Reference Measuring System (RMS). The system will be used to calibrate refuelling pumps up to 700 bar.

The RMS will be positioned on the pump and the fuel hose connected with the reference system. Deviations between the

amount shown on the fuelling station's pump display and the actual certified amount can be determined - and if necessary then calibrated - using pre-determined fuelling pressures and amounts together with a Coriolis flowmeter. In effect, the two displayed values are thereby checked against each another to ensure the exact volume is dispensed. Following the completion of the project, existing and future hydrogen fuel pumps within the CEP project will be calibrated with the involvement of the Bureau of Standards.

GREEN HYDROGEN

13 NIP - HEERSTRASSE HYDROGEN INTERIM STORAGE SYSTEM

Keyword

Heerstrasse hydrogen interim storage system

Commencement

01.08.09

Conclusion

31.01.12

Recipients

TOTAL Deutschland GmbH

ENERTRAG AG

Project budget €

2,151,615

1,984,640

Subsidy amount €

1,032,775

952,627

One aspect of the CEP's goal is the sustainable supply of hydrogen vehicle fleets with hydrogen produced from renewable energies. This is being implemented for the first time in the Berlin region. Cooperating partners TOTAL Deutschland GmbH and ENERTRAG AG will make hydrogen available for cars in Berlin generated from wind power and by means of electrolysis from the middle of 2011.

This project is the ongoing pursuit of the idea behind the Prenzlau hybrid power plant, which ENERTRAG initiated in 2009. It is currently being implemented in cooperation with TOTAL Deutschland, DB Energie and the Vattenfall Innovation GmbH.

Within the framework of the project, ENERTRAG operates a hydrogen interim storage unit together with a compressor unit and fuelling station in Prenzlau. The environmentally-friendly hydrogen will be stored and prepared for refuelling followed manufacture. Thus the project supports not only CO₂-free mobility, but also network integration of renewable power systems. The project thereby offers ways to fulfil the goals of the energy strategy of the Federal Government. The completely CO₂-free generated fuel will be dispensed in Berlin at the TOTAL facility in Heerstrasse to H₂ cars and also partly to H₂ busses.

TOTAL Germany GmbH works as a CEP partner closely together with ENERTRAG AG in this project as one of the leading companies in Europe in the area of wind energy.

During the planned project lifetime (01.07.2009 until at least 31.12.2011) TOTAL will dispense several tonnes of environmentally-friendly hydrogen per month at the hydrogen fuelling station, which is integrated into a public fuelling station. TOTAL will also in cooperation with ENERTRAG AG, fundamentally rework the current generating concept. This will facilitate the continually rising share of renewable energies in the generation of hydrogen over the total operating lifetime of the facility.

The project serves also as a preliminary step towards the proposed hydrogen fuelling station at the new airport in the capital city region: Berlin-Brandenburg-International, where a wind park from ENERTRAG and Vattenfall will supply the TOTAL fuelling station directly with environmentally-friendly hydrogen and electricity.



Patrick Schnell,
Chairman of the Clean Energy Partnership (CEP)

»FOR A SUSTAINABLE LIFESTYLE WE NEED
CLEAN MOBILITY. WORKING TO MAKE THIS
A REALITY IS A GREAT TASK.«

Keyword

BRIST

Commencement	Conclusion	Recipients	Project budget €	Subsidy amount €
01.01.10	31.12.13	Airbus Operations GmbH	6,905,900	3,314,832
		EADS Deutschland GmbH	3,500,516	1,680,248
		Apparatebau Gauting GmbH	1,327,219	637,065
		Berner & Mattner Systemtechnik GmbH	1,277,407	613,156
		Diehl Aerospace GmbH	550,089	264,043
		Deutsches Zentrum für Luft- und Raumfahrt e. V. (DLR)	1,348,396	647,230

The projected increases in air traffic of approximately 5 % per year and the corresponding demand at airports necessitates new developments that reduce emissions. One of these developments is highly efficient electric systems which contribute to saving fuel and thereby protect the environment. Fuel cells as the energy supply for this system offer great potential in generating more efficient and environmentally-friendly electric power, as the engines onboard the aircraft can be freed from parasitic energy loss for electric, hydraulic as well as bleed air, and an autonomous supply on the ground can be secured without engines.

The new approach taken by Airbus for the use of fuel cells in transport airplanes focuses on multifunctionality, i.e. in the use

of electric energy as well as the by-products such as water and exhaust gas as service water or active fire protection. In the project »Fuel cells, integration and system tests/BRIST«, the development and the demonstration of technological maturity (TRL level) of multifunctional fuel cells in the laboratory is of prime importance. Various disciplines are involved in the development of multifunctional fuel cell systems, and the findings of these disciplines must be systematically integrated into the whole product.

In order to cover the broad spectrum of applications, in the BRIST project this innovative system concept is therefore developed with selected partners and subcontractors for onboard application in the form of a common validation platform.

NEW EMISSION- REDUCING DEVELOPMENTS

15 NIP – ROBUST FUEL CELL SYSTEMS FOR MOBILE APPLICATIONS WITH HIGH ENERGY DEMANDS

The project involves the development of a robust, modular technology platform with a high power range for mobile applications in the rail transport and maritime sectors, as well as for transportable applications in the fields of emergency services and the military.

Motivation for the project stems from increasing enquiries from various operators looking for hydrogen-based fuel cell systems with a high output range (>100kW) for application in the above-listed transport areas. These applications possess substantial similarities in regards to their technical requirements such as power range, modularity, resistance to vibrations, mechanical rating and tem-

perature range. Demands in this power range cannot be met in an economically sustainable fashion with the stack sizes currently available to Proton Motor.

To tap into potential synergies between applications and to simultaneously avoid the multiplication of work in individual projects, Proton Motor intends to provide a modular, rack-based technology platform. The technology platform improves users' operating efficiency through, for example, the increased use of common parts that can lead to overall lower costs for spare parts and servicing concepts. The core element of the new technology platform will be the new and yet to be fully developed PM 400 stack.

Keyword

Technology platform

Commencement	Conclusion
01.04.10	31.03.12

Recipients

Proton Motor Fuel Cell GmbH

Project budget €	Subsidy amount €
2,533,828	1,216,237

SYNERGIES

16 NIP – SECOND GENERATION FUEL CELL AIRPLANE

With the Antares H3, Lange Research Aircraft GmbH and the German Aerospace Center (DLR) are developing a high-performance successor to the world's first ready-to run piloted fuel cell airplane Antares DLR-H2. The project began in August 2010, and the maiden flight is scheduled for 2011.

Technically the new airplane will be constructed on the basis of Antares 20E, the electric motor glider in series production since 2004 by Lange Aviation in Zweibrücken as well as the fuel cell airplane Antares DLR-H2. Hydrogen will be converted into electric energy in a direct electro-chemical reaction with oxygen from the air without combustion. The only reaction product produced during the particle-free reaction is water. If the hydrogen is generated through renewable energies, the motor glider flies carbon neutrally.

While the project partners had initially tested the performance of the fuel cells in flight in 2010 using the flying laboratory Antares DLR-H2, and more recently had demonstrated a record-breaking altitude of 2,558 metres, the Antares H3 is set to substantially improve the level of performance. At the final development stage, the developers want to achieve a range of 60 kilometres compared to the predecessor model of 750 kilometres, and a flight time of more than 50 hours, instead of five.

Antares H3 should be able to carry a payload of up to 200 kilogrammes. The airplane will have a wingspan of 23 metres and a take-off weight of 1.25 tonnes. The fuel cell system and the tanks will be housed in four instead of two outer containers under the wings.

Keyword

Antares H3

Commencement	Conclusion
01.03.10	31.03.12

Recipients

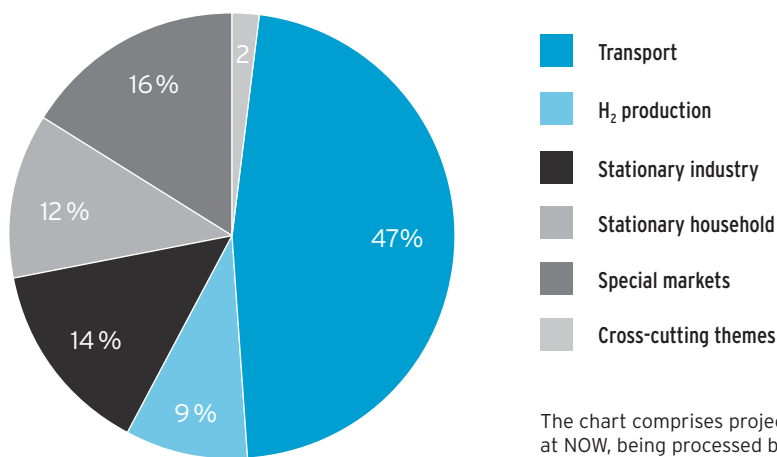
Lange Research Aircraft GmbH

Project budget €	Subsidy amount €
2,109,460	1,012,541

HYDROGEN PRODUCTION

NIP Statistic:

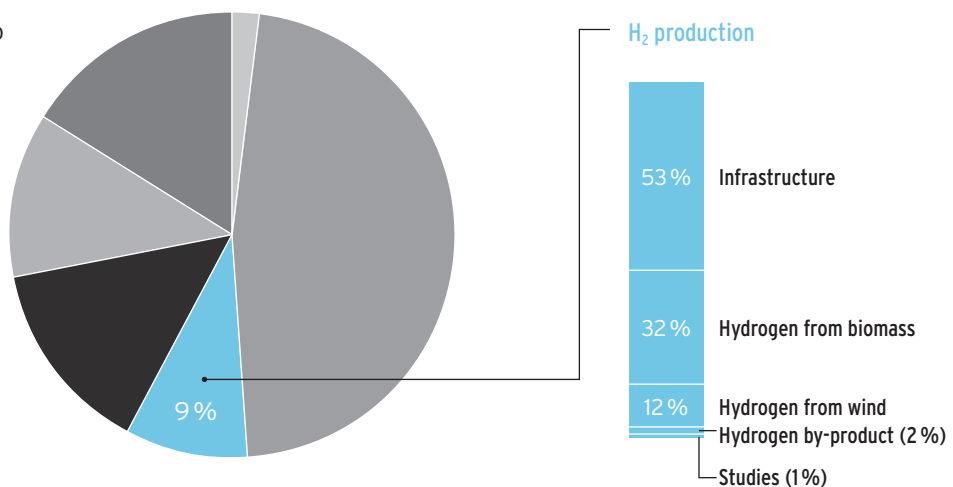
Share according to application sector
As at December 2010



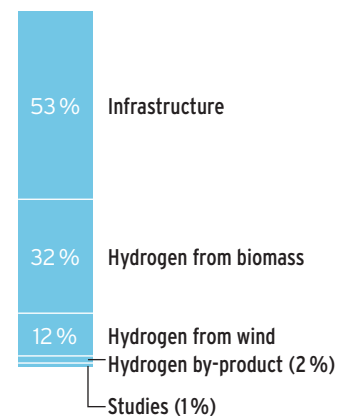
The chart comprises projects at planning stage at NOW, being processed by PtJ, LoI (Letter of Intent) as well as approved projects.

Transport Programme Area:

Allocation according to
application area
As at December 2010



H₂ production



MULTITALENTED HYDROGEN

Whether used as a fuel, an industrial gas for chemical processes or whether it's storing electricity, hydrogen is developing its environmental potential in a number of applications because it can be produced renewably and without emissions from numerous domestic energy sources. More and more hydrogen will be provided for the refuelling of growing fleets of fuel cell vehicles. Because of its high energy storage capacity, hydrogen is a particularly advantageous medium for the storage of renewably-generated and irregularly incoming electricity and can make a substantial contribution to the stabilisation of power supply based on renewable energies. The replacement of fossil fuels by renewably-produced hydrogen in industry also protects the environment. The National Development Plan - the work programme of the NIP - foresees around 54 percent of the entire budget of 1.4 million euro for the transport area. A substantial share is allotted to infrastructure for H₂ production, storage and distribution.

Hydrogen Infrastructure

The planned commercialisation of fuel cell vehicles from 2015 demands the build-up of a comprehensive hydrogen infrastructure. In addition to existing elements, facilities for the production and delivery of hydrogen must evolve mainly in key regions, which then can be linked through fuelling station corridors. According to studies, H₂ has the potential to supply approximately 70 percent of cars and light commercial vehicles in Germany by 2050. It can reduce average fleet emissions by 20 grammes of carbon dioxide per kilometre, at a cost on the scale of current mobility expenditures.

Windy business

Wind energy is developing into the most important source of hydrogen production within NIP. In addition, production in wind-hydrogen systems taps into the storage potential for the energy economy. »Wind-hydrogen systems could be competitive already from 2020. To promote this, NOW are accompanying and coordinating appropriate demonstration projects«, explains Dr. Oliver Ehret, NOW Programme Manager Hydrogen Infrastructure. Hydrogen will be produced by electrolysis, mainly with not otherwise usable surplus wind electricity. The hydrogen will be stored and later used for transport, stationary power supply or industry. For example hydrogen can be delivered to CEP fuelling stations or stored in large quantities underground and converted back to electricity to fulfil energy requirements as needed. This is how hydrogen balances out fluctuations typical of wind energy. In order to be able to operate the facilities on a large scale, the technology must be further developed in respect of for example, high-performance electrolyzers. NOW and partners are collecting experiences in several projects. The Wind-projekt company entered into storage technology with the innovative wind-hydrogen system, 'RH2-WKA'. In the framework of

the CEP, TOTAL and ENERTRAG are planning the world's first CO₂-free fuelling station at the Berlin Brandenburg International airport: from the end of 2012 hydrogen will be produced with electricity from a wind park. In order to test the connection of wind and biomass for hydrogen production in the future, ENERTRAG is currently building a hybrid power plant in Prenzlau: the project comprises three wind turbines, an electrolysis system, a biogas system and two cogeneration units for generating electricity and heat.

Bio-hydrogen

After wind power, biomass is deemed to be the most important energy source in NIP for the production of hydrogen. Biomass consists of energy-rich organic compounds which contain hydrogen. The latter can be developed in a range of environmentally-friendly and efficient ways. The sustainability of the use of biomass is important in this regard, which for example includes mainly the use of biogenic residues and waste. For this purpose demonstration projects are also in progress.

More about hydrogen

In NIP further paths to hydrogen production will be considered. Extraction from industrial by-product hydrogen will remain an issue for the future. Aside from positive environmental effects, it is important to demonstrate the profitability of hydrogen as well. Tapping into the synergy potential between applications in road transport, the energy sector and industry is also essential. Hydrogen also contains a political component: its use reduces Germany's dependence on fossil energy imports. »We are making every effort to support the market preparation of hydrogen technologies and we promote its sustainable production and availability within a nationwide infrastructure«, says Dr. Ehret.

17 NIP – TRANSFER OF RESULTS FROM GERMANHY INTO THE TREMOD EMISSION CALCULATION MODEL

Keyword

TREMOD

Commencement

01.10.10

Conclusion

31.03.12

Recipients

ifeu-Institut für Energie- und Umweltforschung Heidelberg GmbH

Project budget €

219,779 €

Subsidy amount €

219,779 €

TREMOD is the model of the German Federal Government by which energy use and emissions of all modes of transport in Germany has been calculated with great differentiation since 1960 and for future scenarios until 2030. TREMOD data comprises the basis for Federal Government's official reporting concerning transport emissions. Hydrogen is regarded as one of the most promising sources of energy for the future. Its use will enable significant cuts in the dependence on increasingly scarce and costly fossil fuels along with a reduction of greenhouse gases and other airborne pollutants.

The aim of the project is to extend the TREMOD (Transport Emission Model) calculation model to enable scenarios that also take hydrogen into account as a source of energy. With the help of GermanHy (a study considering the ques-

tion »Where will hydrogen come from in Germany between now and 2050?«), this enhancement is now possible for the first time. The GermanHy study developed and described scenarios for the introduction of hydrogen as an alternative fuel for the transport sector. These are now to be implemented in the TREMOD model.

Upon completion, the model enhancement will allow exhaust emissions and energy usage of the transport sector to be calculated until the year 2050, taking various types of fleet configurations and ratios of hydrogen-based vehicles into account. As TREMOD is the recognised method for emission modelling in Germany and each important German transport mode and its umbrella organisation is a cooperation partner of TREMOD, the results from GermanHy will be accessible by all TREMOD users.

ACTIVE CONTRIBUTION TO GRID STABILITY

18 NIP – DEMONSTRATION AND INNOVATION PROJECT RH2-WERDER/KESSIN/ALTENTREPTOW – DEVELOPMENT AND IMPLEMENTATION OF A WIND-HYDROGEN SYSTEM FOR CO₂-FREE STORAGE AND ON-DEMAND DELIVERY OF WIND ENERGY

Keyword

Wind-Hydrogen System

Commencement

01.10.09

Conclusion

31.01.14

Recipients

WIND-WASSERSTOFF-projekt GmbH & Co. KG

Project budget €

9,425,582

Subsidy amount €

4,524,280

The development of renewable energy sources on land and sea is leading to a decentralised energy supply. The energy produced by these methods must be optimised and integrated into the energy supply grid.

This is exactly where the demonstration and innovation project RH2-Werder/Kessin/Altentreptow (RH2-WKA) comes in. By integrating a CO₂-free hydrogen storage facility within a wind park, consumers will gain access to wind energy on demand, regardless of time. In future, regenerative power plants will make an active contribution to increased network stability and to the integration of regenerative energy into the power supply network. The CO₂-free wind-hydrogen system planned in the RH2-WKA project represents a milestone for sustainable industrial application due

to its capacity: The wind park is comprised of up to 28 wind energy plants (partly > 7 mW) with a total load exceeding 140 mW. The high-performance wind park will provide clean energy for approximately 1000 households. In the first project phase, the hydrogen plant will power the wind park itself. It will boast 1mW performance and store the hydrogen at a pressure of 300 bar. The modular design of the hydrogen combined heat and power unit enables performance peaks of up to 250 kWel to be sustained for several hours. Further expansion to a regenerative power plant is planned for the future.

RH2® stands for Renewable Hydrogen. Project planning is being undertaken by WIND-projekt GmbH, which is based in Börgerende, in the state of Mecklenburg-Pomerania, Germany.



Werner Diwald,
ENERTRAG AG Management Board

»DEMAND-ORIENTED SOLUTIONS FOR ELECTRICITY, HEAT AND MOBILITY FROM RENEWABLE SOURCES ARE URGENTLY NEEDED. PART OF THE SOLUTION IS USING HYDROGEN FOR ENERGY STORAGE.«

* With the construction of a hybrid power plant, ENERTRAG is a pioneer of reliable energy supply from fluctuating renewable sources.

Keyword

KoPa II* – Hydrogen refuelling station infrastructure study

Commencement

01.08.09

Conclusion

31.05.10

Recipients

Daimler AG

Linde AG

Project budget €

107,104

Subsidy amount €

53,552

1,205,614

602,807

HYDROGEN: ONE OF THE MOST PROMISING ENERGY SOURCES OF THE FUTURE

Keyword

KoPa II*- Bramfelder Chaussee Hamburg

Commencement

01.04.10

Conclusion

30.09.11

Recipients

Shell Deutschland Oil GmbH

Project budget €

1,684,322

Subsidy amount €

842,161

Keyword

KoPa II*- Eiffestraße Hamburg

Commencement

01.04.10

Conclusion

30.09.11

Recipients

TOTAL Deutschland GmbH

Project budget €

1,251,526

Subsidy amount €

625,763

KeywordKoPa II*- H₂ Trailer 500 bar**Commencement**

01.03.10

Conclusion

30.06.11

Recipients

Linde AG

Project budget €

3,764,040

Subsidy amount €

1,882,020

KeywordKoPa II*- H₂ Mobility Karlsruhe**Commencement**

01.04.10

Conclusion

30.09.11

Recipients

EnBW Energie Baden-Württemberg AG

Project budget €

2,346,684

Subsidy amount €

1,173,342

ALTERNATIVE FUEL

STATIONARY ENERGY SUPPLY





»WE ARE EXTREMELY WELL POSITIONED FOR INTERNATIONAL COMPETITION.«

Kai Klinder, NOW CFO and Programme Manager Stationary Applications

In Situ

Stationary fuel cell units have huge environmental potential: around a third of all energy needs are attributable to power, heating, cooling and hot water. The efficient technologies of combined heat and power plants using fuel cells reduce both energy consumption and environmentally harmful emissions. The supply of energy can even be generated completely free of CO₂ when biogas is used as the fuel. »The technical maturity of the plants has improved substantially,« explains Kai Klinder, NOW CFO and Programme Manager Stationary Applications. »Large-scale market introduction will be possible in just a few years.« Two lighthouse projects coordinated by NOW stand out for their progress in promoting energy supply with stationary fuel cell systems: »Callux« for residential buildings and »e4ships« for ships.

Awakening new energy dimensions

A cornerstone for effective market preparation of new technologies is their reliability and robustness. They must be able to master the tough demands of day-to-day use and guarantee stability. Callux already has experience with over 100 installed household fuel cell heating systems that are in daily use. Meanwhile, the e4ships maritime lighthouse project has deployed numerous types of fuel cell units being tested on ships that are used for either the on-board energy supply or drive system.

Accompanying this work, initiative partners are conducting profitability analyses and are working ardently on issues relevant to the market such as the subject of standardisation, interface problems, logistical aspects or recycling concepts. A key focus is also placed on the human factor: training software - which can be downloaded from the Callux website - has been specially developed to provide service technicians and tradespersons with required background information and know-how to ensure professional installation, support and servicing of the state-of-the-art units.

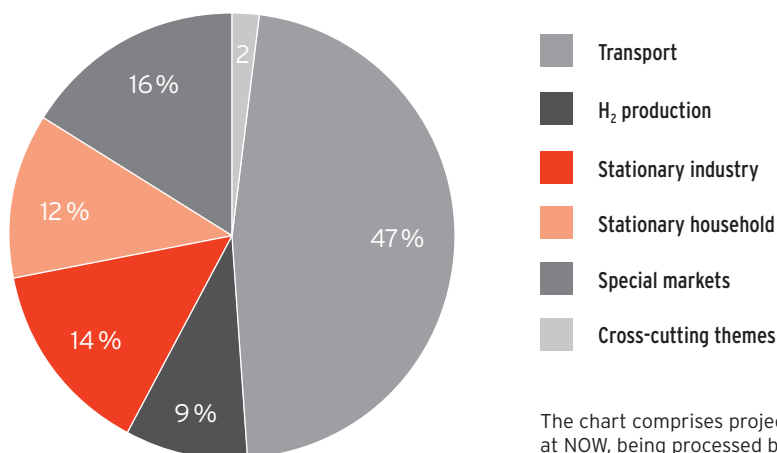
In-depth sophistication

NIP facilitates the continued testing of specialised solutions for the mass market and individual components. For example, exact-fitting tape cast sealing elements are currently being developed for Solid Oxide Fuel Cells (SOFC). These help ensure a long service life and improved quality of fuel cell stacks in smaller stationary units. In the future, glass sealing tapes will be manufactured inexpensively on a large industrial scale, under certified quality management conditions.

Further promising new projects are already on the starting blocks: A combined heat and power plant with SOFC and a progressive, durable plant technology with high temperature Proton Exchange Membrane (HT-PEM) fuel cell. It is insensitive to dust and dirt, and thanks to the difference in temperature to the outside air can be cooled with minimal effort. Kai Klinder summarises: »Today the barriers to market entry have already been reduced to a minimum for stationary plants. We are extremely well placed and prepared for international competition.«

NIP Statistic:

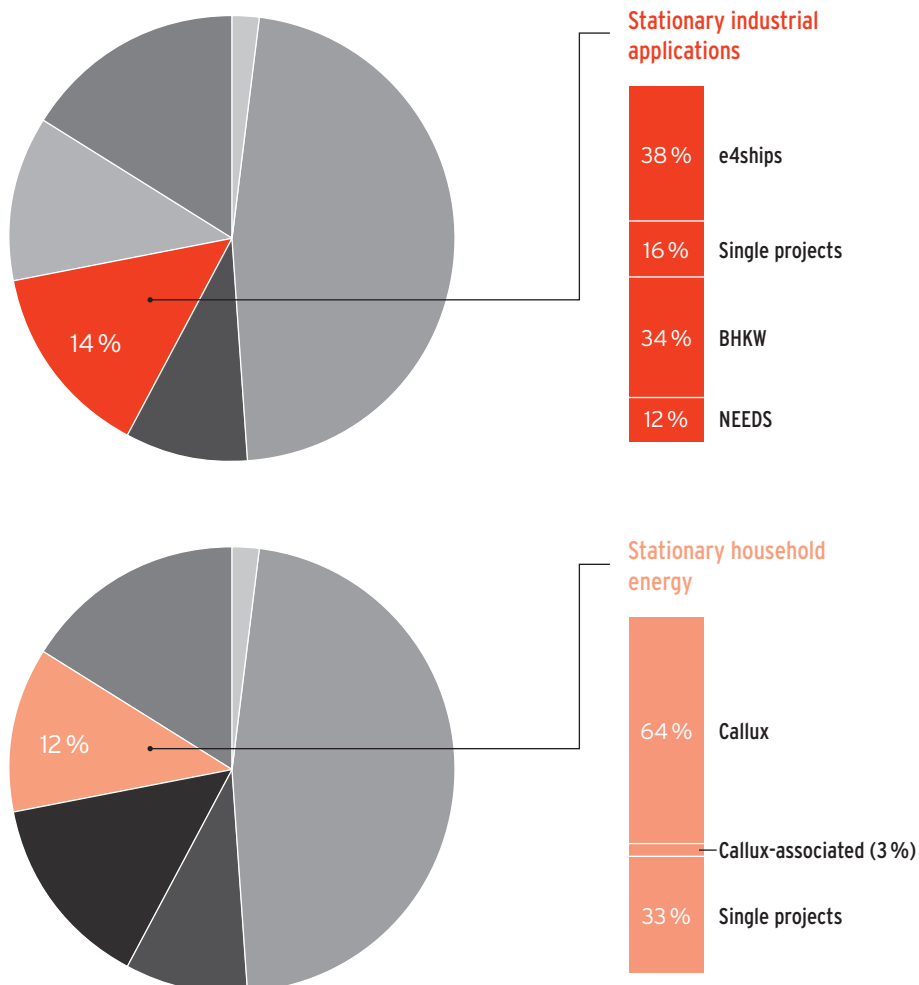
Share according to application sector
As at December 2010



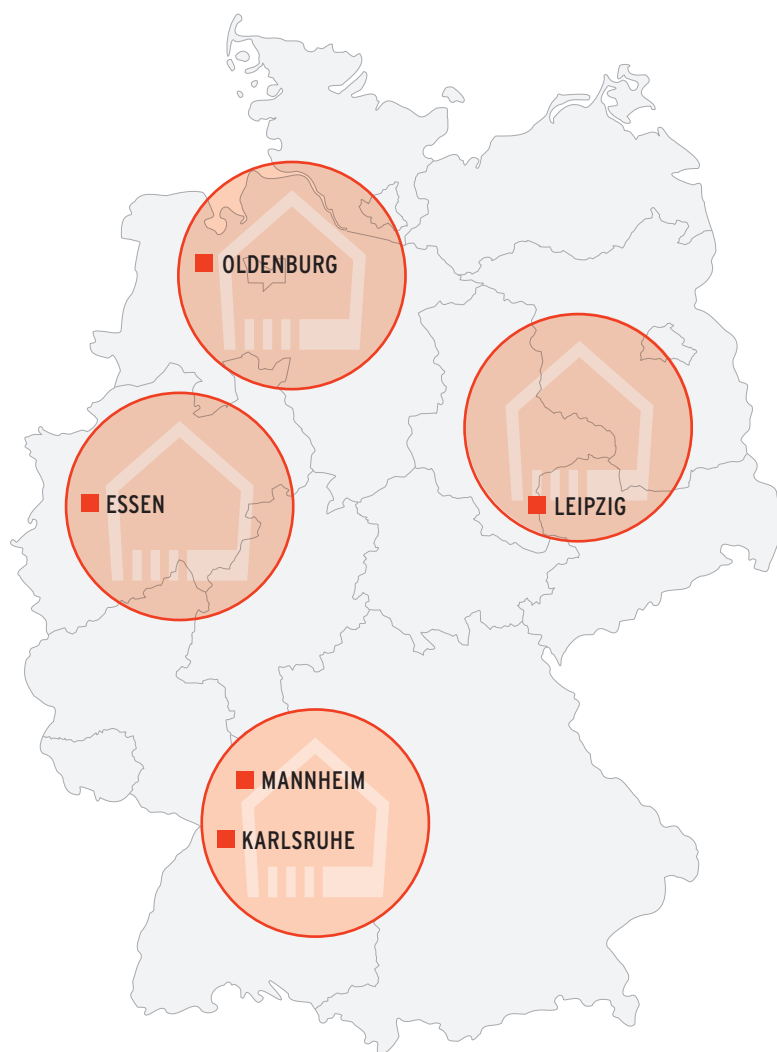
The chart comprises projects at planning stage at NOW, being processed by PtJ, LoI (Letter of Intent) as well as approved projects.

Stationary Applications Programme Area:

Allocation according to application area
As at December 2010



NIP-LIGHTHOUSE CALLUX



 CALLUX REGIONS

Duration
2008-2015

Total project amount
86 million euro
(48 % funded through the
Federal Ministry of Transport,
Building and Urban Develop-
ment, 52 % through consorti-
um partners)



FAREWELL OLD HEATING FURNACE!

The lighthouse project Callux, Germany's largest practical trial of fuel cell heating systems for households, shines on: By the end of 2010, more than 100 aggregates were already in operation in both detached houses and apartment buildings. The efficient, eco-friendly fuel cell units reliably supply the buildings with power and heating generated via an electrochemical process. »Our aim is their application in everyday operation and we have come significantly closer to our goal with this lighthouse project,« explains Kai Klinder, NOW CFO and Programme Manager Stationary Applications. Thanks to a coordinated approach and targeted communication between the parties involved, NOW is paving the way for international cooperation. Callux partners are the energy providers **EnBW**, **E.ON Ruhrgas**, **EWE**, **MVV Energie** and **VNG Verbundnetz Gas**, the equipment manufacturers **BAXI Innotech**, **Hexis** and **Vaillant** as well as the **Zentrum für Sonnenenergie- und Wasserstoff-Forschung (ZSW)**.

Callux cracks a century

The end of 2010 saw Callux pass the mark of 100 installed aggregates in private households, which are scattered throughout Germany. By 2012, the number is set to rise to a total of 800. EWE will climb to 300, EnBW to over 200, with E.ON Ruhrgas, MVV and VNG making up the balance. Thanks to the trial's positive interim results, the energy sector and industry have been able to boast numerous advances. Project participants are also delighted with the advantages their fuel cell heating systems provide: they have reduced their energy costs and have enjoyed a stable and reliable supply of heat and energy – despite extreme winter temperatures. The periodic visits of the system developers are often the only thing reminding the homeowners of participation in the trial.

Reliable service

Besides innovative units, a successful market introduction of stationary fuel cells requires, above all, competent service technicians that carry out the installation, support and maintenance professionally. To ensure this, the project partners have developed special software together with educational institutions that can be downloaded from the Callux homepage free of charge. The »Informationsprogramm Brennstoffzellen-Heizgeräte« (Fuel Cell Heating Systems Information Programme) is a useful guide that conveys the fundamentals of the new technology including power-heat coupling, system hardware and information on the use of these innovative units. Targeted didactic and visual elements including graphics and animations ensure content is superbly delivered for the professional training of tradespersons. In addition, this software is also aimed at energy consultants, architects, planners, teachers, students and anyone else interested in receiving background information on environmentally-friendly energy supply using stationary fuel cells.

Openness and transparency

Providing information and raising public awareness are integral aspects of the communication activities of NOW and the Callux partners. Participants and interested parties can obtain detailed information about individual projects, their locations and on-site representatives via a special service featured on the Callux website that includes an interactive project map. A telephone hotline is a further communications tool that Callux provides for interested parties. The public's openness towards innovative clean technologies is reflected in the growing interest in project participation. After all, fuel cell heating systems are the environmentally-friendly alternatives to conventional heating systems.

Hotspot: Technology

Fuel cell heating systems are combined heat and power plants that boast high efficiency. Via a reformer, they convert natural gas into the required hydrogen, which is transformed to heat and power electrochemically. This direct transformation of energy results in extremely low emissions. In terms of their thermal and electrical performance, the units are designed for use in detached houses and apartment buildings. Should extreme heating requirements need to be catered for, a natural gas burner is engaged automatically. Only a few requirements are necessary for the installation of fuel cell heating systems in buildings: a DSL connection, access to the natural gas supply and sufficient space for the unit itself – which is comparable to conventional heating systems.

Business of the future

The Callux partners are simultaneously testing the technical maturity of the aggregates and their durability and reliability in day-to-day operation within the framework of the current forward-looking fuel cell heating system trials. Commencing in 2008, the National Innovation Programme Hydrogen and Fuel Cell Technology (NIP) will run for a total of seven years with investments taking place across the entire term. The total volume of the programme is 86 million euro. Industry partners will provide 52 % of the funds. The Federal Ministry of Transport, Building and Urban Development (BMVBS) fund the remaining 48 %. »Callux enables us to make important contributions to protecting the environment, stimulating value creation in Germany and laying the foundation for the export of innovative products,« summarises Kai Klinder. Customers at home thereby stand to profit from the dual innovative leap from a conventional heating system to a money-saving, power-generating fuel cell system with environmentally-friendly gas technology.

Keyword

Household energy lighthouse, phase II

Commencement	Conclusion	Recipients	Project budget €	Subsidy amount €
01.01.10	31.12.14	EnBW Vertriebs- und Servicegesellschaft mbH	5,540,330	2,659,358
01.01.10	31.12.14	EWE ENERGIE AG	7,957,493	3,819,597
01.01.10	31.12.14	MVV Energie AG	1,376,766	660,848
01.01.10	31.12.14	E.ON Ruhrgas AG	4,002,490	1,921,195
01.01.10	31.12.13	VNG-Verbundnetz Gas AG	571,172	274,163

Within the framework of the National Innovation Programme Hydrogen and Fuel Cell Technology (NIP), five energy providers and three manufacturers of fuel cell heaters in the area of »stationary applications for household energy supply« are conducting a significant lighthouse project. EnBW, E.ON Ruhrgas, EWE, MVV Energie and VNG – Verbundnetz Gas along with BAXI Innotech, Hexis, Vaillant and the Zentrum für Sonnenenergie- und Wasserstoff-Forschung (Centre for Solar Energy and Hydrogen Research) Baden-Württemberg (ZSW) are collectively promoting future technologies that facilitate the decentralised generation of both energy and heat in households.

The complete project spans a timeframe from 2008 to 2015. One of the main objectives of Callux is to develop fuel cell heating units into reliable systems suitable for everyday use, and to prepare the broad market introduction of natural gas-powered units for domestic energy supply. The participating energy suppliers will undertake this through the purchase,

installation and operation of a large number of fuel cell heating units. Long-range project planning, split into individual phases and combined with technical targets ensures that the momentum is maintained to arrive at a level of technical maturity and develop marketable units. Improvements to the long-term stability and lifespan of stacks for example, and the reliability of fuel cell heating units will here play a particularly important role.

Besides the field trials at the heart of the project, accompanying measures to prepare for market introduction will also be undertaken. Subjects regarding infrastructure, market partners (particularly the training of tradespersons), market research, joint communications and scientific monitoring will be developed and revised. Further information about Callux, Germany's largest practical trial for household fuel cells, can be found at www.callux.net, where a project map and database provide information concerning the current status of the trials.

THE BIGGEST PRACTICAL TRIAL OF FUEL CELLS FOR HOUSEHOLDS NATIONWIDE



Andreas Ballhausen,
Chairman of the Fuel Cell Initiative (IBZ)

»NOWHERE ELSE IN HOME ENERGY SUPPLY
WILL THE PRIMARY ENERGY SOURCE NATU-
RAL GAS BE USED MORE EFFICIENTLY THAN
IN A FUEL CELL HEATER.«

Keyword

GLASSeal

Commencement	Conclusion	Recipients	Project budget €	Subsidy amount €
01.03.10	30.09.12	KERAFOL Keramische Folien GmbH	761,551	365,544
01.03.10	30.08.12	Forschungszentrum Jülich GmbH	262,366	125,936

Glass sealing tapes have established themselves the world over as a recognised method for the joining and sealing of solid oxide fuel cell (SOFC) stacks. Further research and development in regard to their long-term performance and reliability when in operation is still required. The investigation of potential cost savings in the manufacture of stacks is also crucial as they are pivotal for the market penetration of SOFC technology.

Tape cast sealing elements that are pressed to the exact design requirements are advantageous for stack assembly. These can be examined for their suitability and quality prior to the joining process. In contrast to applying the taping material as a paste via a syringe, stack assemblers can achieve significant cost reductions due to considerable time savings brought about through the elimination of intermediate drying stages.

The aim of the GLASSeal project is the development of optimised, reliable and long-lasting glass sealing tapes with simultaneous thermocyclability in order to allow stack and system manufacturers to create highly-robust impermeable systems. Moreover, processes will be developed to enable the cost-effective mass production of tape cast sealing elements. Through the development of corresponding industrial scale production capacities and optimised QM systems, glass sealing tapes are to be made commercially available at an affordable price in the future.

STABILITY AND RELIABILITY IN OPERATION

Keyword

International standardisation

Commencement

01.01.10

Conclusion

31.12.10

RecipientsEckhard Schwendemann Technical
Management Consulting**Project budget €**

66,997

Subsidy amount €

66,997

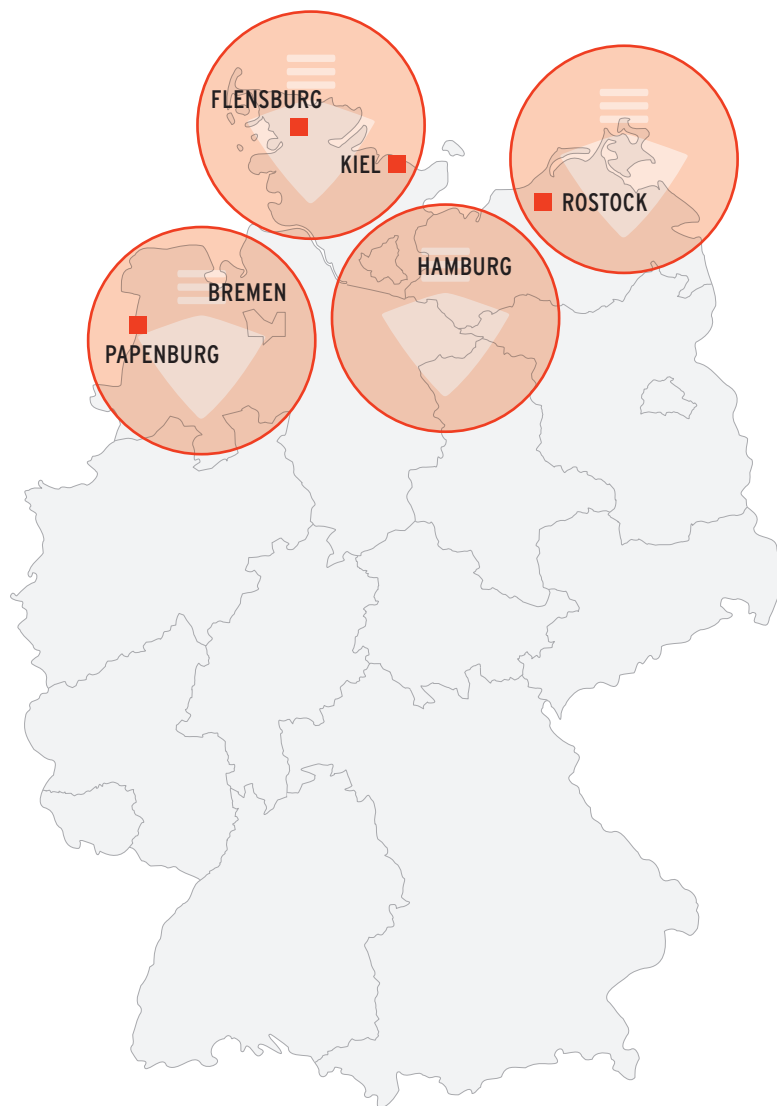
The German fuel cell heater industry is taking a leading role in Europe with the help of significant funding support through the NOW. Indeed, compared to the USA or Canada it has a head start. Japan however, is regarded globally as clearly topping the list. In the international standardisation of fuel cell heaters at the IEC TC 105 (International Electrotechnical Commission Technical Committee on Fuel Cell Technologies), an IEC 62282-3-x standard came into being, which clearly differs from the European standard EN 50465 in terms of safety, performance and the application concerned. This situation poses a further threat to German and European fuel cell heater manufacturers, because access to internationally available parts is becoming more difficult and the marketing of the units outside of Europe is almost impossible.

To reduce or remove this competitive disadvantage, an analysis of the actual status of technical standards was commissioned through the NOW in 2010, and a strategy was prepared which shows how this disadvantage can be reduced. Through strategic and success-

ful content placement of proposals for revision, an important first step was able to be made towards European safety philosophy in IEC TC 105. Leading the way here is Mr. Eckhard Schwendemann of ES-TMC, who in a conscientious way, and in coordination with the German committee representatives, Dr. Imgrund (DKE K 384), Mr. Endisch (Chairman of the European Committee CEN/CLC JWG FCGHA) and Mr. Schraube (EIFER), succeeded in leveraging the technically precise German amendments within an inter-cultural dialogue, against initially very openly manifested opposition. Steps towards further technical and strategic understanding with USA/Canada and also Japan have been taken. A priority for the coming years aside from the development of »IEC 62282-3-400 (EN50465)«, is to see a harmonisation of »IEC 62282-3-100« under the European gas appliance directive and the completion of the three parts »IEC 62282-3-x«. The project is therefore set to continue with many promising prospects.

INTERNATIONAL STANDARDISATION FOR FUEL CELL HEATERS

NIP-LIGHTHOUSE E4SHIPS



 E4SHIPS REGIONS

Duration
2009-2016

Total project amount
50 million euro



Shipping accounts for just under three percent of global CO₂ emissions. Added to this are pollutants such as sulphur dioxide, nitrogen oxides and soot particles resulting from the use of heavy oil as fuel. To alleviate this burden on people and the environment, shipyards, shipping lines, fuel cell manufacturers and classification societies banded together in 2009 to establish the »e4ships« NIP light-house project, which is coordinated by NOW. Together they are developing and testing new technologies to replace conventional ship aggregates for onboard power supply.

All in the same boat

AIDA Cruises, CMT, DNV, Elsflether Zentrum für Maritime Forschung, Flensburger Schiffbau-Gesellschaft, Germanischer Lloyd GL, HAW Hamburg, hySOLUTIONS, Fr. Lürssen Werft, Helmut-Schmidt-Universität, Imtech, INVEN Engineering, MEYER WERFT, Oel-Wärme-Institut (OWI), Reederei Rörd Braren, Thyssen-Krupp MS, HDW, VSM and ZBT will join e4ships on their common voyage until 2014. After MCFC technology was initially planned for implementation, the sub-projects PaXell and SchiBZ then required rescheduling in mid-2010. Suitable fuel cell technology from new suppliers has been sourced in the meantime and integrated in both demonstration modules. The approximately 50 million euro of funds is provided in equal parts from the project partners and the Federal Ministry of Transport, Building and Urban Development (BMVBS). »Fuel cells enable us to significantly reduce emissions from ships, particularly in harbours, and thereby meet legislative regulations,« explains Kai Klinder, NOW CFO and Programme Manager Stationary Applications.

Environmental regulations for coastal regions and harbours are becoming more rigorous: For example, with SECA (Sulphur Emission Control Areas), the International Maritime Organization (IMO) will prescribe more stringent limits of fuel sulphur content in the North and Baltic Sea control areas by 2015. With the introduction of fuel cells for the onboard power supply on ships, pollutants harmful to health and the environment can be substantially reduced and efficiency simultaneously increased. Reduced noise emissions and vibrations from the engine also ensure a more comfortable journey for passengers.

Efficiency on board

Megayachts, container and cruise ships all have very high energy demands. It is therefore advisable to generate heat and power using a cogeneration system based on SOFC or HT-PEM fuel cells. At sea and close to shore, they boast significantly higher effectiveness with reduced emissions than today's typical power supply systems for performance levels of up to 500 kilowatts. Air quality is also enhanced during layovers in the harbour when used as the supply system for the auxiliary power units. It is planned to increase the performance of the fuel cells to one megawatt

and to enable the decentralised implementation of the system in distributed areas on board. This efficient concept for energy distribution opens up new design possibilities for ship builders, also allowing existing safety concepts to be optimised. The e4ships partners are supporting the practical application of this concept through simulations and modelling calculations leading to the development of individual components and their effective interaction in the overall system.

The new units are also already working reliably in the smaller performance class of up to 100 kilowatts: Proton Exchange Membrane (PEM) fuel cells can even provide for the entire drive energy for small ferries and excursion vessels in the low temperature operating range. An example is the »Altsterwasser« in Hamburg: This vessel features two 48-kilowatt fuel cells operating within a hybrid system that is buffered with high-performance batteries.

Anchors away

The project participants aim to develop environmentally-friendly technologies with lower cost for the future. In terms of market preparation, common technical standards for all system variations and ship performance classes are being followed. The parties involved are putting a general framework in place to help minimise potential future limitations for the implementation of the innovative systems. This includes: building aggregates from currently available components; simple integration in existing ship systems; the use of environmentally sustainable yet logistically available fuels; and the design of the safety systems with a view to trouble-free certification. »We're looking towards series production from 2020,« says Kai Klinder. »High performance fuel cells let us anchor the vision of sustainable onboard energy supplies on ships.«

04 NIP – E4SHIPS: FUEL CELLS IN MARITIME USE

Keyword SchIBZ				
Commencement	Conclusion	Recipients	Project budget €	Subsidy amount €
01.06.09	31.03.13	Emder Werft und Dockbetriebe GmbH	2,829,432	1,358,127
01.06.09	31.12.10	MTU Onsite Energy GmbH	679,372	326,099
01.06.09	31.03.13	Imtech Marine Germany GmbH	1,713,365	822,415
01.06.09	31.03.13	Germanischer Lloyd SE	751,011	360,485
01.06.09	31.03.13	Helmut-Schmidt-Universität - Universität der Bundeswehr Hamburg	215,880	90,880
01.06.09	31.03.13	Rörd Braren Bereederungs-GmbH & Co. KG	57,976	27,828
01.04.10	31.03.13	OWI OEL-WÄRME-INSTITUT gGmbH	1,267,717	1,267,717

The SchIBZ group initiative within the e4ships lighthouse aims to develop a 500 kW power generator with heat integration for seafaring vessels. The aggregate is to be constructed using currently available marketable components that will be adapted for implementation on ships.

The main characteristics of the development project include: a modular design, utilisation of road-grade diesel (10 ppm sulphur) for primary energy, suitability for isolated operation through the use of a power buffer, as well as a compact construction that is suitable for use on ships. The goal will be attained

through the participating partners constructing a 100 kW demonstration system that conceptually corresponds to a 500 kW unit (in terms of the number and arrangement of components) using SOFC modules that are currently available. The safety system will be developed with the help of suitable analyses thereby assisting in the acquisition of relevant certifications. Following a range of trials on land, the unit will be tested on a ship at sea for approximately one year. Simultaneously, larger SOFC modules will be developed that are to be implemented for series production, and measures for manufacture will be prepared. Project completion is expected for early 2015.

05 NIP – PAXELL

Keyword PaXell				
Commencement	Conclusion	Recipients	Project budget €	Subsidy amount €
01.04.09	31.12.10	MTU Onsite Energy GmbH	373,624	179,340
01.04.09	31.03.14	DNV Germany GmbH	870,539	417,859

Following the withdrawal of MTU from the fuel cell segment, a new fuel cell manufacturer, Serenergy, joined the Pa-X-ell project. The transition from the MCFC (molten carbonate fuel cell) technology of MTU to the HT-PEM (high-temperature proton exchange membrane) technology of Serenergy could therefore be seamlessly implemented and without delay.

The specifications were adapted so that the desired electric and thermal utilisation of the energy of the HT-PEM fuel cell system would be achieved for applications on land as well as for other applications, e.g. maritime.

Specifically a basic module of a standard size (19" insertion/plug-in technology) is to be developed on the basis of existing

Serenergy technology. In the first stage, this module should have around 20 kW at approx. 10 rack units. These basic modules will then be built on top of one another and alongside each other as racks similar to modular switchgear systems. Thus at a later stage, any power performance is possible. The basic module will be available as a prototype until the end of 2011. A rack with 4 or 5 basic modules is expected a year later for testing phase.

The integration of the fuel cell module in the energy system of a ship is far advanced. A newly developed absorption-type refrigeration system in conjunction with a freshwater production system (trigeneration system) go into testing phase shortly. Likewise the concepts for fuel supply, LNG and methanol/ethanol are also highly developed.

Keyword

Toplaterne »e4ships«

Commencement	Conclusion	Recipients	Project budget €	Subsidy amount €
01.10.09	30.09.14	hySOLUTIONS GmbH	194,886	93,545
		AIDA Cruises – German Branch of Costa Crociere S.p.A.	67,954	32,618
		DNV Germany GmbH	102,549	49,224
		Fr. Lürssen Werft GmbH & Co. KG	84,867	40,736
		Flensburger Schiffbau-Gesellschaft m.b.H. & Co. Kommanditgesellschaft	69,672	33,443
		Germanischer Lloyd SE	246,925	118,523
		Hochschule für Angewandte Wissen- schaften Hamburg	64,414	30,919
		MTU Onsite Energy GmbH	169,629	81,422
		Meyer Werft GmbH	85,789	41,180
		Emder Werft und Dockbetriebe GmbH	140,451	67,416
		Elsflether Zentrum für maritime Forschung GmbH	132,403	63,553
		Verband für Schiffbau und Meerestechnik e. V.	103,189	49,531
		Zentrum für Brennstoffzellen-Technik GmbH	118,276	56,773

The e4ships lighthouse project aims to significantly improve the onboard supply of heating and power on seafaring ships through the use of fuel cells. Besides the issue of technical implementation on various types of vessels, a further major challenge regards the derivation of uniform technical standards that can be applied to all system variations and performance categories.

In contrast to conventional ship aggregates, fuel cells can significantly contribute to reducing emissions. With strict environmental regulations and emission ceilings today being imposed on an increasing number of maritime areas (so-called ECA zones), reducing pollutants has become a priority for shipping companies.

e4ships is comprised of various project modules: In Pa-X-ell, a fuel cell module (HT PEM) is currently being developed that will be tested on a cruise ship for the decentralised generation of power and heat. Meanwhile, in the SchIBZ module, a fuel cell unit with diesel reformer is being developed that is suitable for use at sea and will be tested under practical conditions (SOFC).

The superordinate Toplaterne module addresses all issues dealing with the ecological, technical and economic aspects of implementing fuel cells on ships. The technical and economic evaluation of the demonstration projects enables optimisation potentials to be identified and leveraged for use of fuel cells on ships.

FUEL CELLS FIT FOR HIGH SEAS

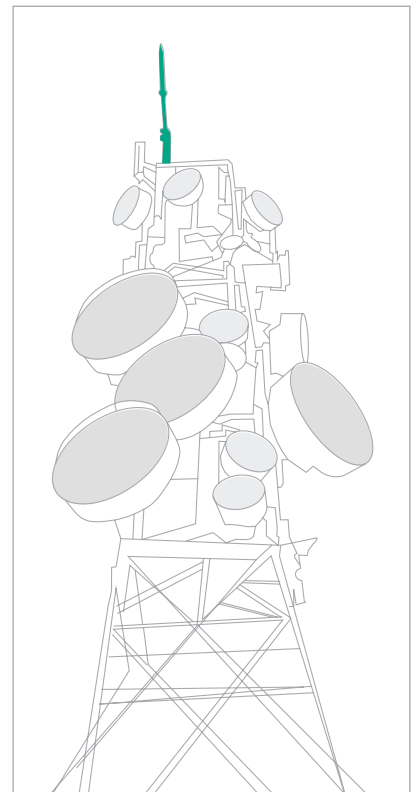
07 FURTHER PROJECTS

Keyword

NIP storage city of Potsdam

Commencement	Conclusion	Recipients	Project budget €	Subsidy amount €
01.05.2010	31.12.2014	Energiepark Brandenburg GmbH & Co. KG	4,347,346	2,086,726

SPECIAL MARKETS



FEUERWEHR



POLIZEI



»DEMONSTRATION PROJECTS GENERATE A HIGH LEVEL OF PUBLICITY AND THEREBY PROVIDE AN IMPORTANT FOUNDATION FOR THE SPREAD AND INCREASING MARKET ACCEPTANCE OF FUEL CELL TECHNOLOGY.«

Wolfgang Axthammer, NOW Programme Manager Special Markets

Special Markets – playing a key role in market acceptance

Market preparation and launch, the demonstration of practical suitability and transition to series production are essential goals in the Special Markets programme area of the National Innovation Programme Hydrogen and Fuel Cell Technology (NIP). Special markets feature in a vast number of small- and medium-sized innovative companies as well as widely diversified applications. »Demonstration projects generate a high level of publicity and thereby provide an important foundation for the spread and increasing market acceptance of fuel cell technology«, explains Wolfgang Axthammer, NOW Programme Manager Special Markets. 6 projects consisting of 9 proposals were approved within the Special Markets programme area in 2010. The entire budget of these projects is 12.1 million euro (5.7 million euro of which was subsidised). Projects with a total budget amount of around 170 million euro were declared in 2010. This area of application thereby constitutes approximately 23 percent of the entire NIP budget in 2010 – a surprisingly high number, which far exceeds the ten percent originally projected in 2006. This will be taken into account in the revision of the National Development Plan of NIP in 2011.

The projects in the Special Markets area are divided into application segments, the aims of which include the optimisation of components and systems, integration developments and refuelling infrastructure as well as approval issues.

Fuel cells for leisure and tourism

The Bodensee (Lake Constance) project – fuel cell applications in leisure and tourism, was begun in 2009 under the premise of preparing the fuel cell technology market in the leisure area. Essential tasks in this regard were the identification, initiation, cross-linking and support of project initiatives. On the state level, the eleven-month project ran successfully through funding from the Environmental Ministry of Baden-Württemberg, so that the expansion on national level and formal integration into the structures of the NIP could begin. The project, which was originally limited to the Bodensee (Lake Constance) region, is being extended. New partners from attractive and especially environmentally-oriented tourism areas, for example HyPort in the town of

Waren on Lake Müritz (Mecklenburg-Western Pomerania), are joining in. From the »Bodensee Project«, the lighthouse initiative »Leisure and Tourism« will emerge. The coordination and further development of the lighthouse initiative »Leisure and Tourism« will be the responsibility of the Weiterbildungszentrum Brennstoffzelle Ulm (WBZU GmbH) (Fuel Cell Education and Training Center Ulm), supported through the Zentrum für Solarenergie- und Wasserstoff-Forschung (ZSW) (Centre for Solar Energy and Hydrogen Research Baden-Württemberg).

Specifically the Bodensee Project, and »Leisure and Tourism« is about the onboard electrical supply of motor homes as well as drive systems for light vehicles and boats. Of the BODENSEE's sub-projects, three were already completed in 2010.

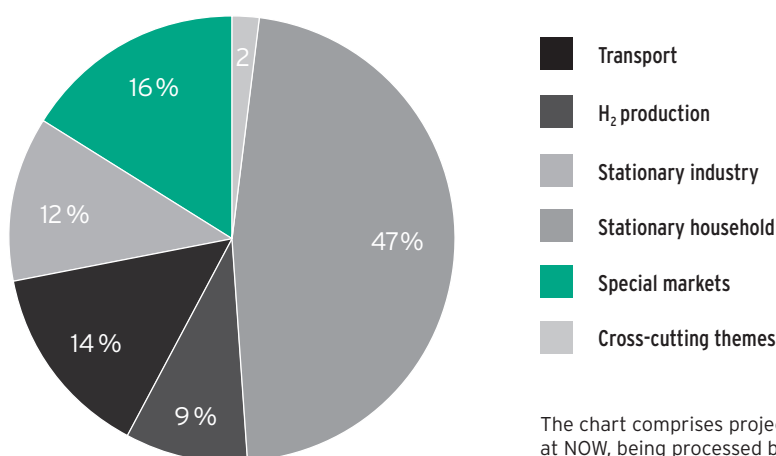
NIP Lighthouse Project »Clean Power Net«

The launch of »Clean Power Net« (CPN) took place in October 2010. The goal is to form a national and cross-sector collaboration of companies as a lighthouse project: »Fuel cells for uninterrupted electricity supply in industry and business«. The manufacturers and users of fuel cells in telecommunications, information technology, industry and traffic-control systems could use CPN as a custom-made platform to group together both existing know-how and goals more efficiently, and consequently profit early from any synergies. This construction phase will be supported by the Bavarian State Ministry for Economy, Industry, Transport and Technology. The Clean Power Net should leverage the commercial deployment of fuel cell technology. According to Wolfgang Axthammer: »Central objectives are the demonstration of fuel cells as an innovative, sustainable and economically interesting solution in one of the largest markets worldwide: uninterruptible power supply.«

A particular feature of the UPS market is that users are taking a leading role – and demanding fuel cell technology. Telecommunications companies such as Deutsche Telekom AG, the E-Plus Gruppe are focusing on the advantages of fuel cell technology.

NIP Statistic:

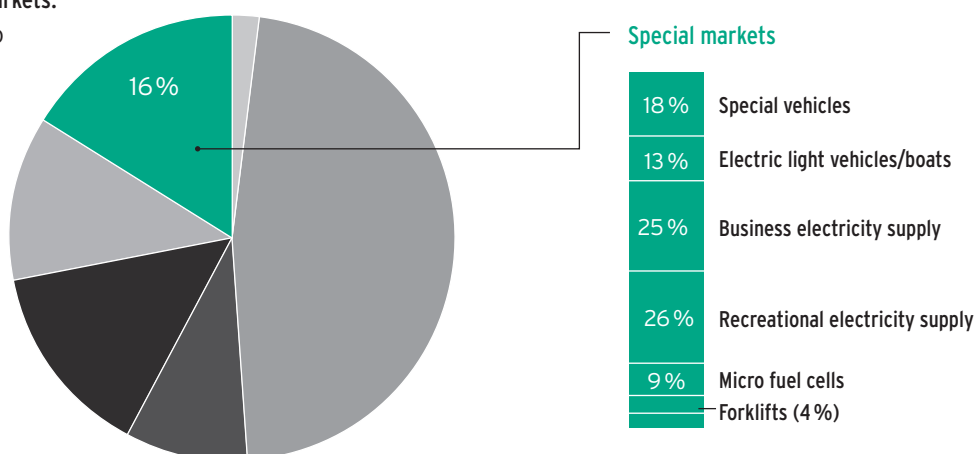
Share according to application sector
As at December 2010



The chart comprises projects at planning stage at NOW, being processed by PtJ, LoI (Letter of Intent) as well as approved projects.

Programme Area Special markets:

Allocation according to
application area
As at December 2010



Their service providers, OEM partners of the fuel cell industry such as PASM Power, Air Condition Solution Management and Nokia Siemens Networks support the implementation of innovative energy concepts to reach company targets for CO₂ emissions reduction, in the knowledge that up to 85 percent of the energy requirements of a mobile phone provider would be needed for the network to meet demand.

Obstacles and recommendations for the future

The application segment »Special Markets« plays a key role in the establishment of fuel cell technology through its advanced marketability and application maturity. This also affirms the Verein Deutscher Ingenieure (VDI) (German Engineers Association) study submitted in August

2010: »Development of a market launch programme for fuel cells in special markets«. Building upon a market analysis, the study recommends concrete measures for the establishment of German technological leadership: creation of market incentives such as support for users as well as a CO₂ substitution bonus for deployment in a low power range. In addition a public procurement programme should be rolled out for fuel cell systems in BOS digital radio, the German armed forces and the Technischen Hilfswerk (Federal Agency for Technical Relief) as well as vehicles with fuel cells for local operation. Accompanying measures such as a simplified approval procedure, the build-up of a hydrogen infrastructure, an image campaign, stronger linking of actors as well as standardisation on the part of suppliers will additionally complement this area.

GRID-INDEPENDENT ELECTRICITY SUPPLY FOR RECREATIONAL VEHICLES

01 NIP – VEGA 2000 – ON-BOARD POWER SUPPLY FOR RECREATIONAL VEHICLES DEMONSTRATION PROJECT

Keyword

VeGA 2000

Commencement

01.02.10

Conclusion

31.01.13

Recipients

Truma Gerätetechnik
GmbH & Co. KG

Project budget €

3,439,377

Subsidy amount €

1,547,719

The favourable technological and economic conditions in the caravanning/ recreational market make it an ideal point of entry for fuel cell systems. Growing customer demands for comfort matched with the desire to use recreational vehicles self-sufficiently and off the beaten track call for the implementation of innovative solutions. Fuel cells systems for recreational vehicles provide a range of significant advantages over other conventional network independent power supply sources such as generators, which include: operation independent of time and weather; good accessibility; low weight; and negligible noise and exhaust emissions.

Truma has been involved in the development of a suitable reformer fuel cell system for several years. The VeGA ag-

gregate boasts a maximum electrical output of 250 watts and utilises liquid gas, which is already both tried and tested and widely used in the caravanning market.

A main focus of the project is the development and testing of production processes and methods that will enable Truma and other involved suppliers to manufacture significant numbers of fuel cell systems. Large-scale implementation of up to 2,000 units is planned for end-users, which will ensure the generation of extensive publicity. In addition, the project will assist in further qualifying and strengthening the domestic fuel cell supplier industry.



Kaike Friedrichsen,
Manager WBZU GmbH

»WITH FUEL CELL PRODUCTS THAT ARE CLOSE TO MARKET IN THE LEISURE AND TOURISM AREAS, WE CAN INCREASE PUBLIC ACCEPTANCE OF THIS TECHNOLOGY.«

Keyword

Osiris

Commencement

01.02.10

Conclusion

31.01.13

Recipients

Alunorf GmbH

Project budget €

367,839

Subsidy amount €

176,562

Aluminium Norf GmbH (AluNorf) is testing the implementation of a fuel cell system for the emergency power supply for its fire department, medical centre and crisis control centre, within the framework of the National Innovation Programme (NIP). Named »Osiris«, the demonstration project aims to highlight the advantages of fuel cell technology over that of conventional emergency power supply systems such as batteries or diesel generators. The focus of the tests will be on environmental impact, energy efficiency and cost savings. Information regarding the operability, availability, maintenance, service and life cycle will be gathered through practical tests. The aim is to ascertain whether this fuel cell technology is marketable and suitable for implementation in heavy industry. Alu-

Norf uses a modular fuel cell system from the company Rittal that consists of three PEM fuel cells, each with an output 2.5kW. Two inverters convert the produced direct current into alternating current. The »Fuel Cell and Maintenance« project of the FVI (Forum Vision Instandhaltung) commenced in January 2011, with the participation of NOW and other players in industry and research. The project's aim is to demonstrate the potential of fuel cells for industrial maintenance applications. Aludorf will significantly contribute to this project initiative.

INDUSTRIAL FIELDS OF APPLICATION

Keyword

Plakonexa

Commencement

01.05.10

Conclusion

30.04.12

Recipients

Heliocentris Energiesysteme GmbH

Project budget €

1,589,181

Subsidy amount €

762,807

The project will examine if a universal fuel cell platform can address the varying needs encountered across the host of different applications for special markets. On the basis of an existing platform generation 1 (Heliocentris Nexa 1200) unit currently used as a teaching tool, applications will be tested together with various evaluation partners in industrial situations such as: emergency power

supplies, independent power supply systems, and light vehicles. Following an extensive demonstration phase, an assessment will be made that will highlight in what instances it makes sense to bundle applications via a platform. Detailed specifications for an optimised platform generation 2 for industrial implementation will then also be defined and developed.

Keyword

USVProgas

Commencement

01.09.09

Conclusion

31.08.12

Recipients

FCPower Fuel Cell Power Systems GmbH

regio iT aachen - gesellschaft für
informationstechnologie mbh

Project budget €

1,322,009

693,226

Subsidy amount €

634,564

332,748

Besides a few niche applications, fuel cells have not yet gained broad access to the world market. This is especially due to complex system peripherals, which lead to only a few players being active in the market capable of providing prototype systems. The primary goal is therefore to enter into the uninterruptible power supply (UPS) market of IT servers and telecommunications with modular propane gas-driven fuel cell systems in a performance range spanning 1kW to 20kW.

The project aims to test and promote the application of propane gas fuel cell technology as a UPS unit in practise. Furthermore, regio iT aachen aspires to reduce the infrastructural technology required for data centre operations while enhancing flexibility. A reduction in electrical and thermal power

losses is planned, and the overall effectiveness of the energy supply will be increased along with longer hold-up times. Over a three-year project period, the simulation, packaging and construction of the first 1kW systems will be tackled in phase one. Anticipated in the subsequent second project phase will be a further development cycle and the demonstration of 5 kW systems. The technology used by FCPower in this performance class - especially for UPS applications where high hold-up times are necessary - is superior to conventional technologies.

INDEPENDENT ENERGY-PRODUC- TION SYSTEMS

05 NIP – MEA COST REDUCTION THROUGH DEVELOPMENT OF INNOVATIVE PRODUCTION PROCESSES: MEA-KORREKT

Keyword

SolviCore

Commencement

01.04.10

Conclusion

31.03.13

Recipients

SolviCore GmbH & Co. KG

Project budget €

5,745,756

Subsidy amount €

2,757,963

An important factor for the successful market penetration of fuel cell products is the establishment of cost-effective manufacturing processes.

Membrane Electrode Assemblies (MEAs) are the electrochemical heart of Proton Exchange Membrane (PEM) fuel cells and have the greatest influence on the cost structure of fuel cell systems.

The cost goals for mass-market application of stationary and automotive fuel cell systems are still far from being reached. Among the major reasons for this is the high degree of manual process still existing in the MEA production process today. Solvicore will pursue the development and trial of concepts for the automation of MEA production for future mass production within the framework of this project. Productivity is to be enhanced

through innovative, continuous processes, and reject rates as well as overall production costs are to be simultaneously reduced.

The main areas in focus will include paste production, coating and assembly. The »MEA-KORREKT« project is being developed and tested in conjunction with selected German subcontractors in the areas of research and industrial manufacturing technologies that exhibit cost-saving potential. The project is creating a new type of technology platform to establish an internationally competitive, complete MEA production process. It thereby is strengthening Germany's industrial position in comparison to the current MEA production market leaders from Japan and North America.

06 NIP – ROTOPRESS REFUSE VEHICLES

Keyword

Rotopress Refuse Vehicles

Commencement

01.04.10

Conclusion

31.03.13

Recipients

Berliner Stadtreinigungsbetriebe (BSR)

Heliocentris Energiesysteme GmbH

FAUN Umwelttechnik GmbH & Co. KG

Project budget €

1,197,345

297,335

159,882

Subsidy amount €

574,725

142,720

76,743

SUCCESSFUL MARKET PENETRATION THROUGH FUEL CELLS



Dr. Silke Wagener,
Freudenberg FCCT KG, General Management

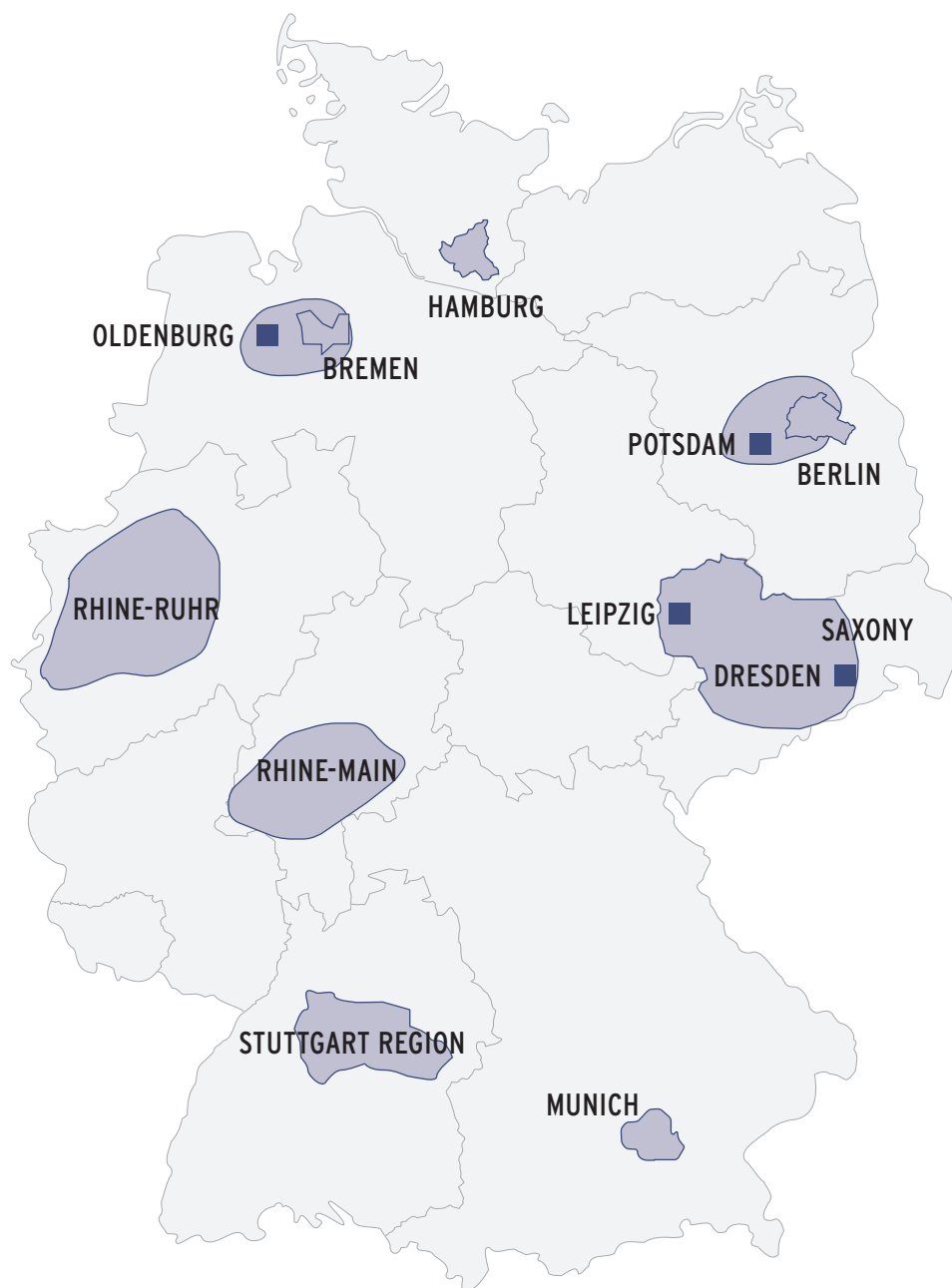
»HYDROGEN WILL BECOME AN
ECONOMIC FACTOR IN THE COMING
YEARS. THE SUPPLY INDUSTRY IS
RELYING ON THIS.«

ELECTROMOBILITY MODEL REGIONS





ELECTROMOBILITY MODEL REGIONS



»ELECTROMOBILITY CAN BE DEPLOYED IN ALL TRANSPORT SECTORS. THIS SHOWCASES THE WORK OF THE MODEL REGIONS.«

Oliver Braune, Electromobility Programme Manager

2010 dynamic developments

The Electromobility in Model Regions Funding Programme of the Federal Ministry of Transport, Building and Urban Development (BMVBS) is part of the Electromobility National Development Plan. It will enable Germany to develop into the leading market and leading supplier for electromobility by 2020 and consequently put one million electric vehicles on the road. With their application-oriented projects, the eight model regions [Berlin/Potsdam](#), [Bremen/Oldenburg](#), [Hamburg](#), [Munich](#), [Rhine-Main](#), [Rhine-Ruhr](#), [Saxony](#) and the [Stuttgart region](#) are promoting the rapid development of electromobility in Germany. The focus of the programme is the research and development as well as the market preparation and market launch of (battery-) electric vehicles. With a budget of around 130 million euro, the funding programme was adopted in 2009 in the framework of the second economic stimulus package (KoPa II) of the BMVBS and runs until the end of 2011.

All projects gathered speed in 2010

2009 was essentially about the initiation and approval of the funding projects in the eight model regions, while 2010 was marked by the concrete implementation of versatile individual projects on electromobility. Since the beginning of the funding programme, 70 local and regional project consortia work with more than 200 partners on gradually preparing electromobility for everyday use. To this end, companies from the automotive and the supply industry sectors as well as energy suppliers, universities, research institutes and local facilities are all involved in the sustainable market introduction of electromobility. The project consortia receive support from a regionally-established project headquarters in each model region. The eight project headquarters stay in regular contact with each other and maintain the information exchange with the National Organisation Hydrogen and Fuel Cell Technology (NOW GmbH), responsible for the coordination of the programme.

Central fields of action of the funding programme

At all levels in the model regions, as many experiences with electromobility as possible will be gathered within the project time period. This will provide valuable impetus for further market development beyond the duration of the project. In every model region the project consortia and

their respective partners were chosen in such a way as to highlight individual strengths of the region and thus identify a specific aspect of electromobility. Together all eight model regions supply information and knowledge for the nationwide introduction of electromobility in Germany. At the same time, on the basis of the activities in the model regions, responses to both central fields of action of electromobility will be given, which are in the forefront within the framework of the funding programme.

Transport field of action

Consideration of the different transport and vehicle applications belong in particular to this field of action. In the area of private transport, electric cars, two-wheeled vehicles and pedelecs are being introduced onto the roads. In terms of public transport, hybridised city busses and rail vehicles will be deployed as well as electric transport. Last but not least, hybridised or fully electrified transporters and urban commercial vehicles demonstrate the potential use of electric vehicles in commercial transport. Probably around 2,800 vehicles will go into operation from the indicated categories and will be tested in everyday use in the model regions until the end of the programme.

Infrastructure field of action

The construction of a reliable, secure and comfortable charging infrastructure with free access in primarily public and semi-public areas plays a significant role as an additional field of action. Several hundred different charging points will be introduced in the model regions through the cooperation of large energy suppliers, regional public utilities and the respective local authorities.

Cross-regional platforms

Aside from the two central fields of action which are covered through the project focal points in the model regions, there are further accompanying task assignments, which will be examined and evaluated in comprehensive consortia. These activities deal first and foremost with technical and socio-scientific accompanying research and supplement the practical demonstration projects. In addition cross-regional platforms will be set up, which will network the model regions with each other and secure a continuous information exchange.

CORE ELECTROMOBILITY THEMES

CROSS-REGIONAL PLATFORMS

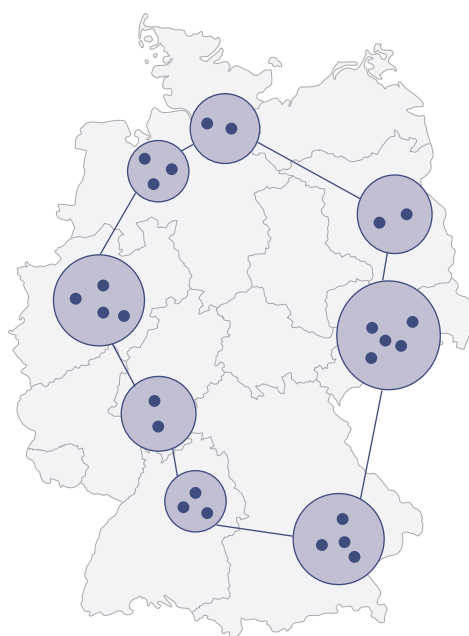
Aside from the different projects in a total of eight model regions, issues were defined and are being dealt with comprehensively in the Federal Ministry of Transport, Building and Urban Development's (BMVBS) funding programme Electromobility in Model Regions. They were conceived as cross-regional platforms and address central themes associated with the introduction and establishment of an electromobile concept. The goal is to centrally bundle findings and experiences from the model regions, and scientifically monitor them. Furthermore the platforms assist in the intensive exchange of experience between all partners. The platforms make clear which themes and aspects associated with the introduction of electromobility must be addressed and determined, so that electromobility can work and be accepted by customers. The cross-regional platforms break down into priority and cross-cutting themes, which because

of a matrix structure, are closely linked with each other. The focus is on infrastructural and vehicle-specific themes (especially passenger cars, transporters and busses). From these the cross-cutting themes of environment/security, socio-scientific accompanying research and legal frameworks can be derived. The communication and the expectation management constitute a separate platform.

The arrangement of the cross-regional platforms illustrates the partner structures of the project consortia in the model regions. Representatives from industry, science and research as well as the public sector are together working on current and future electromobility challenges. Through their project experiences and specialist backgrounds, the participants of the platforms are qualified experts in their respective areas.

- 1 Communication and Expectation Management
- 2 Legal frameworks
- 3 Socioscientific accompanying research
- 4 Accompanying research: Environment
- 5 Busses
- 6 Passenger cars/transporters
- 7 Infrastructure

- Single projects
- Coordination area of the regional project headquarters
- Coordination area of the overarching platforms



»THE VERIFICATION OF THE EVERYDAY SUITABILITY OF ELECTROMOBILITY IS ONE OF THE CORE THEMES OF THE BMVBS ELECTROMOBILITY FUNDING PROGRAMME.«

Christina Tenkhoff, Electromobility Programme Manager

Communication and Expectation Management platform

So that all participants and the broader public can get a picture of the activities of model regions and platforms, the development and progress of the funding priorities of the Federal Ministry of Transport, Building and Urban Development will be continually reported upon. The goal of the communication measures is to familiarise user groups with the possibilities of electromobility, so that a broad acceptance can be created at an early stage. Together with the NOW, single model regions along with their project headquarters assemble together the information from the running projects, prepare and regularly publish status reports and information brochures. All information is accessible through the different project websites and through the listed contact details.

Legal frameworks platform

The task within this platform is to identify and consider the relevant legal framework conditions early on in the planning stage for the introduction of electromobility. Because the authorities at local, state and national level are confronted with legal issues in introducing electromobility, these will be administered and dealt with centrally. Through the involvement of representatives from the public sector, relevant local rules can be identified and urban development conditions defined that are affected by electromobility. Conditions for the provision of inexpensive parking and recharging facilities in public areas or the effect of monetary and non-monetary incentives in introducing electromobility will be discussed among other topics. Last but not least, rules must be made for a symbol for parking and charging spaces reserved for electromobility and criteria determined for the sharing of special lanes such as bus and taxi lanes.

Socioscientific accompanying research platform

Because the introduction of electromobility is associated with big changes in the existing transport and utilisation structures, end customers and operators must be involved in the project from the start. The socioscientific accompa-

niment of the funding programme examines electromobility from the user's point of view, who use electric vehicles and the charging infrastructure in the model regions. During the lifetime of the demonstration projects fleet operators and drivers of different electric vehicles were interviewed on three different occasions on their experiences in dealing with vehicles and infrastructure.

Aside from surveying user groups, the participating cities will be consulted on local developments. The resulting information should form the basis of a roadmap outline »Electromobile City« and ensure that the further development of electromobility will be supported by customers and local authorities alike.

Secondary research platform: Environment and safety

This platform focuses on two thematic priorities: on the one hand the effects of electric vehicles on the environment will be illustrated, and on the other the safety in running the vehicles in the model regions will be guaranteed. In the environmental area, the ecological (relief) effects regarding everyday usability and cost effectiveness will be examined and compared with conventional vehicles based on environmental performance evaluations along the whole energy chain. From this, knowledge for the further development and potential of electromobility will be gained. The Wuppertal Institute is undertaking the scientific aspects of the platform.

In the safety area, a body of experts will deal with the operational safety of vehicles and battery systems. Gaps in safety can thus be identified and handled early. Furthermore, recommendations for the increase in safety will be delivered.

The platform will be supplemented by experts, who will also contribute on an international level in committees on the creation of norms and standards for electromobility.

SUSTAINABLE DECREASE IN EMISSIONS AND NOISE IN CITY CENTRES

Secondary research platform: Innovative drives/busses

The use of electric busses in public transport in the model regions offers an opportunity to lower emissions and noise in inner cities. The scientific accompanying research deals with the evaluation of different hybrid concepts which are being deployed in the model regions and assesses the technical and economic potential of the technology in comparison to conventional diesel busses. In addition tangible vehicle specifications such as mileage, fuel consumption and airborne pollutants (CO₂ und particles) of busses in scheduled line service and in special test drives will be centrally collected and evaluated.

Passenger car/Transporter Platform

Aside from the busses in the area of public transport, the deployment of electric passenger cars and transporters illustrates the second important pillar of electric vehicles. The focus of scientific consideration is on private and commercial use of electric vehicles. Within the platform, mobility patterns and ways of operating fleets are compared with and without electric vehicles. It will be examined when and for what goals electric vehicles can be deployed and how many kilometres can be driven in them.

In goods and delivery traffic in the cities, the rise in efficiency of the vehicle through hybridisation in transporters and medium-duty lorries also contributes to the reduction of environmental impact through reduced exhaust emissions. Furthermore plug-in hybrids offer the opportunity to drive purely electric short journeys, bringing the further advantage of reducing noise pollution in cities.

Infrastructure platform

The development of a user-friendly and demand-oriented recharging infrastructure is an essential component of electromobility. The economic and regulatory challenges will be examined associated with the construction of a nationwide recharging infrastructure. It is vital to highlight costs and uses for the installation and operation of public and semi-public recharging stations and adjust the regulatory frameworks.

The local authorities play an important role in the build-up of public recharging infrastructure, as they establish rules for the operators. The goal is to create a non-discriminatory public infrastructure which facilitates simple, customer-oriented access. For this purpose, new types of calculating systems for current at recharging points will be developed. Suitable contractual and business models will be determined in cooperation with large energy suppliers and small regional public utilities.

01 KOPA II – SUPPORT AND FURTHER DEVELOPMENT OF A FIRST SMALL FLEET OF DIESEL-HYBRID CITY BUSES WITH ELECTRIC CAPABILITY

In August 2009 model regions in Germany were chosen by the BMVBS in which the electrically-operated city bus Citaro G BlueTec® Hybrid from Daimler Bus – EvoBus GmbH plays an important role for electromobility. With the world's first deployment of a small fleet of serial hybrid busses with purely electric driving capability, the market maturity of the new technology can be evaluated for the first time in real operating conditions. In order for the project to succeed, close, professional support for the vehicles and operators by the manufacturers is necessary in the first phase, as the technical degree of innovation compared to other drive concepts is high. This support goes above and beyond regular support of serial vehicles. Thus this close support ensures

that the prospects and risks of the new drive technology during the project phase can be conveyed through examples of real operation by operators. In addition it guarantees that weak points in »real operation« can be acknowledged and addressed with appropriate measures. »ElmoS – fleet test« deals with volumes for the technical support of Citaro G BlueTec® Hybrid vehicle in several locations as well as the further development and optimisation of the entire drive train. Furthermore potential and additional need for action for the further development of electromobility in Germany can be derived during and following the project.

Keyword

ElmoS

Recipients

EvoBus GmbH

Project budget €

15,556,710

Subsidy amount €

7,778,355

INCREASE IN VEHICLE EFFICIENCY THROUGH HYBRIDISATION

Keyword		
HyMEP 1		
Recipients	Project budget €	Subsidy amount €
Daimler AG	12,192,960	6,096,480
Keyword		
HyMEP 2		
Recipients	Project budget €	Subsidy amount €
Daimler AG	12,700,000	6,350,000
Keyword		
Atego		
Recipients	Project budget €	Subsidy amount €
Mercedes-Benz Leasing GmbH	2,263,542	1,131,771

The commercial vehicle today shoulders over 70 percent of the entire freight traffic in Germany as well as in Europe. The worldwide applicable guidelines for pollutant emissions is bringing the commercial vehicle sector over the coming years close to the goal of zero emissions for nitrogen oxide (NOx) and diesel particle emissions (PM). Today and in the future, the focus is consequently on the climate effects from global mobility. On the path to sustainable mobility, the commercial vehicle sector of Daimler AG in the framework of the »Shaping Future Transportation« initiative continues to drive forward the drastic reduction of fuel consumption and exhaust emissions. The hybridisation of lorries is a cornerstone of this policy.

In this way Daimler AG has consistently advanced the hybridisation of Mercedes-Benz lorries: the Mercedes-Benz Atego BlueTec® Hybrid is a milestone in the development of sus-

tainable commercial vehicles as the first visible result of this commitment. It combines the economical Diesel EEV drive train with a parallel hybrid system. The Li-Ion battery delivers additional energy to start, accelerate and drive on inclines; braking will charge the batteries through brake energy regeneration. Hybrid systems and automatic start/ stop engines create 10-15 % fuel/CO₂ savings and a significant noise reduction already in the inner city area. Central issues are reliability, safety, practical suitability and versatility. The first vehicles will be delivered soon to German customers.

The Atego BlueTec® Hybrid was awarded with the German Sustainability Prize 2010 in the »Most sustainable product« category.

FOCUS ON CLIMATE EFFECTS OF GLOBAL MOBILITY

03 KOPA II – DIWAHYBRID – PARALLEL DIESEL HYBRID BUSES

Keyword

DIWAhybrid

Recipients

Voith Turbo GmbH & Co. KG

Solaris Bus & Coach S.A.

Project budget €

1,973,454

Subsidy amount €

986,727

1,035,272

517,636

The project aims to make a positive contribution in Germany towards environmental protection and the development of electric drives. A diesel hybrid bus with parallel diesel and electric motor has been developed for this purpose, with the drive technology supplied by Voith Turbo and the busses by Solaris. The new Solaris Urbino 18 DIWAhybrid is the result – an articulated bus with room for 161 passengers.

An asynchronous electric motor supports the diesel motor while starting to drive and accelerating in the DIWAhybrid. The asynchronous machine acts as a generator that produces electrical energy during braking, thereby also relieving the demands on the service brake while simultaneously reducing brake wear and the resulting production of fine particle matter.

Energy recovered during braking is stored in a 410 kg Supercap system. This newly-developed storage system boasts a storage capacity of 500Wh. Ensuring that passenger cabin space is not

compromised, the Supercaps are located on the vehicle roof, as is the Voith converter.

With 150kW of electric drive power, the DIWAhybrid system considerably reduces the loads placed on the diesel motor. This allows smaller diesel motors to be implemented (»downsizing«), thereby also playing a part to increase energy efficiency.

The subsidised pre-series vehicle has been tested in the Rhine-Ruhr electromobility model region by the Bochum-Gelsenkirchener Straßenbahnen AG (BOGESTRA) since the beginning of January 2011. Following a six-month field trial, the first series production vehicles will follow in summer 2011. Ten additional busses of this type – two of which will be subsidised by the BMVBS (German Federal Ministry of Transport, Building and Urban Development) – will be deployed in the Rhine-Ruhr model region in early summer 2011.

GREEN ELECTRICITY

04 KOPA II – E-MOBILITY BERLIN/HAMBURG: VEHICLE CONSTRUCTION AND DEMONSTRATION

The interplay between automotive technology and the corresponding recharging infrastructure in day-to-day operation is being tested within the framework of the »e-mobility Berlin/Hamburg« project. The aim is to use the insights gleaned from practice to groom electromobility for everyday use.

For this purpose, Daimler is supplying a fleet of 200 electric vehicles in Berlin and Hamburg. Besides the smart fortwo electric drive, Mercedes-Benz A-Class E-CELL vehicles will be deployed at a later phase. Both vehicle types are equipped with lithium-ion battery technology. The recharging infrastructure partners RWE and Vattenfall are building 500 recharging points in Berlin and 100 in Hamburg respectively. Daimler AG is making the ve-

hicles available on the basis of a full-service leasing model to selected fleet, business and private customers. It includes all servicing and maintenance as well as third party and comprehensive vehicle insurance, along with sets of both winter and summer tyres. RWE and Vattenfall provide customers with access to the public recharging infrastructure. Furthermore, an intelligent recharging box will be installed at home enabling vehicles to be charged with green electricity.

This demonstration project was initiated as a private commercial project by Daimler and the infrastructure partners, and is now being supported by the BMVBS (German Federal Ministry of Transport, Building and Urban Development).

Keyword

e-mobility Berlin/Hamburg

Recipients

Daimler AG

Project budget €

19,753,297

Subsidy amount €

7,506,253

Keyword

Plattform SoWi

Recipients

Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (FhG)

Project budget €

479,141

Subsidy amount €

479,141

The socio-scientific accompanying research platform has two thematic priorities: the analysis of customer acceptance as well as in the area of electromobility and urban design.

The administration of the project as well as the examination of the customer aspect is the responsibility of the Fraunhofer Institute for Systems and Innovation Research (Fraunhofer-Institut für System- und Innovationsforschung ISI) in Karlsruhe. For this purpose, the Fraunhofer ISI is coordinating a working group with participants from all model regions, in which the regional findings on customer research flow together, and where the construction of a uniform database on all projects in the model regions will be

coordinated. On this basis the Fraunhofer ISI is creating a customer demand and acceptance profile for electromobility. The theme of electromobility and urban design is the responsibility of the Fraunhofer Institute for Industrial Engineering and Organisation (Fraunhofer-Institut für Arbeitswirtschaft und Organisation (IAO)) in Stuttgart. This comprises a survey of cities involved in the model regions programme, the innovation competition »Electromobile City 2050« as well as the description of international approaches to connect electromobility with urban planning. The results will be compiled by Fraunhofer IAO in a roadmap entitled »Electromobile City« and presented to the public at a conference in the autumn of 2011.

ELECTROMOBILE CITY

Keyword

Plattform Umwelt

Recipients

Wuppertal Institut für Klima, Umwelt, Energie GmbH

Project budget €

224.087

Subsidy amount €

224.087

The goal of the project is to estimate the environmental (relief) effect of electromobility with regard to everyday use and cost effectiveness. The priority lies in energy consumption and climate change.

The following were defined as research tasks:

1. The use and analysis of data from the single research projects of the electromobility model regions research programme for individual journeys and charging procedures of electric vehicles and comparison with non-electric traffic management.
2. Furthermore in a more systematic consideration in the area of private vehicle use: comparison of mobility patterns with and without electric vehicles, and
3. Additionally in a more systematic consideration in the area of commercial vehicle use: comparison of ways of operating fleets with and without electric vehicles.

Special working groups were set up around the following policy issues:

- »Energy mix«: Which electricity generation mix will be taken as a basis for the operation of electric vehicles?
- »Comparison vehicle«: Which non-electric vehicles will form the basis for comparison?
- »Noise and pollutants«: What changes in noise and pollutant emissions are to be expected?
- »Environmental performance evaluation«: How are electric vehicles on further definition of the assessment framework to be comparatively evaluated?

Duration of research projects:
May 2010 – July 2011

Volkswagen has set itself the goal of becoming leader in the area of CO₂-neutral mobility. In this context it has started the »Think Blue« campaign and brought a number of different models to market under the »BlueMotion« brand, which are especially characterised by their low fuel consumption. The Touareg Hybrid came into series production already in the past year. Following the introduction of hybrid technology for serial vehicles, now a test fleet of electric drive Golfs will prepare the way for Volkswagen to begin series production of electric vehicles.

The objective of the fleet test: Volkswagen will conduct a fleet project with 80 fully electric Golfs from May 2011, which will take place in Wolfsburg, Berlin and Hanover.

With the deployment of 80 vehicles, Volkswagen Kraftwerk GmbH is especially pursuing the goal of learning about the interaction between electric vehicles and privately- and publicly-accessible charging infrastructure. As much empirical knowledge on user acceptance and practical suitability of Volkswagen electric vehicles will be gathered as possible. Aside from technical know-how, the perception and active behaviour of users are of great interest – notably regarding the charging process and the associated framework conditions.

The vehicle: The Golf blue-e-motion, a fully-fledged car with five doors and five seats, will be silently powered by an electric engine with a maximum output of 85 kW/115 hp integrated into the front engine compartment; the continuous output is 50 kW/69 hp. As with all electric motors, the aggregate in the Golf delivers a very high maximum torque (270 Newton metres) from a standstill.

The result: more fun driving emission-free. The electricity for the operation of the electric engine will be stored in a lithium-ion battery with a capacity of 26.5 kWh. The fast and very aerodynamic 135 km/h Golf blue-e-motion (drag coefficient: 0.295) has sufficient reserves to be on your way quickly with little energy use or even only to »cruise«. The sprint time of 0 to 100 km/h in 11.8 s is an indication of its good dynamic qualities.

Charging the vehicle: The vehicle can be charged in single-phase with 3.3 kW (normal plug) as well as using a three-phase current with 9.9 kW. A specific charging cable is part of the vehicle's equipment.

One of Volkswagen Kraftwerk's authorised electricians will carry out a user household safety test, so that safe recharging can take place from the home. The charging box could be installed in the garage or in the carport, designed to make the charging process more convenient.

Access to public charging infrastructure is also planned for in the project. Users of the vehicles: Users have already been chosen on the basis of demographic information and appropriate mobility profiles. The group of users is made up of both private householders and commercial organisations. The user contractually accepts the project-specific conditions of use.

Duration of the project: From the day of handover, vehicles will be available to the users until the end of 2011.

Keyword

E-Golf

Recipients

VW KRAFTWERK Gesellschaft mit beschränkter Haftung

Project budget €

20,618,644

Subsidy amount €

9,896,949

MORE FUN DRIVING EMISSION-FREE

Keyword

NIP - D-F FOT

Recipients

EnBW Energie Baden-Württemberg AG

Project budget €

1,053,626

Subsidy amount €

526,813

Porsche Engineering Group GmbH

1,250,660

500,264

Siemens AG

391,980

195,990

Innovations Software Technology GmbH

518,885

207,554

Keyword

NIP - PRIMOVE

Recipients

Bombardier Transportation GmbH

Project budget €

7,680,337

Subsidy amount €

3,686,562

Keyword

KoPa II - Single track BEV

Recipients

Bayerische Motoren Werke AG

Project budget €

2,525,423

Subsidy amount €

1,261,449

Keyword

KoPa II - Electro folding bike

Recipients

Bayerische Motoren Werke AG

Project budget €

2,075,426

Subsidy amount €

1,037,713

Keyword

KoPa II - NILS

Recipients

Volkswagen AG

Project budget €

9,842,264

Subsidy amount €

4,921,132

Keyword

KoPa II - NaBE-B

Recipients

PE International GmbH

Project budget €

118,541

Subsidy amount €

118,541

Keyword

KoPa II - Safety test centre

Recipients

Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW)

Project budget €

14,608,161

Subsidy amount €

13,147,345

Keyword

KoPa II - Automotive service tests

Recipients

CETECOM ICT Services GmbH

Project budget €

1,631,910

Subsidy amount €

815,955

Keyword

KoPa II - Battery test centre P10

Recipients

SGS Germany GmbH

Project budget €

1,400,372

Subsidy amount €

700,186



MODEL REGION HAMBURG

HEINRICH KLINGENBERG, HEAD OF THE PROJECT HEADQUARTERS

Hamburg is the 2011 European Green Capital – how do the activities of this electromobility model region contribute to justifying this title?

Vehicles emissions and noise affect the quality of life in cities. For the protection of the environment and the climate, a reduction in fine dust, nitrogen oxide and CO₂ is crucial. This applies especially to Hamburg as the 2011 European Green Capital. Nevertheless, electric vehicles still contribute little to emissions reduction today. But proving their suitability for everyday use helps them to be accepted by users. The ongoing field test contributes to justifying even more Hamburg's awarded title for the future.

What role does electromobility play in the future city planning of Hamburg?

As a port, Hamburg is reliant on functioning commercial transport. A functional mix of working and living is required in order to preserve the character of the city and limit both traffic volume and the use of land. Electric vehicles could become more significant in terms of balancing these demands. Serial diesel hybrid busses could service

line sections in city areas with high requirements in terms of air quality or noise protection by operating purely electrically.

What chances are being offered to users of electromobility with respect to comprehensive linking of different modes of transport?

Experts anticipate that city dwellers will in future choose how they travel more carefully. In addition, awareness of the negative climate effects resulting from the use of fossil fuels is growing. A common intermodal choice of bus and train with electric vehicles for local transport can on the one hand, attract new customers and on the other hand, offer a welcome addition to local and regional public transport, expanding availability in terms of time ranges and areas covered by services.

Keyword

hh=more Modul 1

Recipients

Hamburger Hochbahn AG

Project budget €

7,957,531,25

Subsidy amount €

3,819,615

In the diesel hybrid project up to ten serial diesel hybrid busses of Daimler's subsidiary Evobus will gradually be deployed in regular line service of Hamburger Hochbahn AG. The low-emission busses are the first in Germany with a serial drive which can facilitate purely electric operation from battery alone. True to the sense of the word »hybrid«, two different energy storage systems (fuel tank and lithium-ion battery) and two energy converters (electric and combustion engine) are used in the diesel hybrid bus.

The diesel motor will only be used for electric power supply in the serial hybrid and does not operate the vehicle directly. In addition this new generation diesel engine is considerably more compactly shaped than in other busses (»downsizing«). The combination of »downsizing«, the operation of the engine in the optimal speed range, and the recuperation (recovery of energy) will result in substantial fuel savings and correspondingly less CO₂ emissions. So far two busses are delivered and in operation.

ENERGY STORAGE SYSTEMS

Keyword

hh=more Modul 3

Recipients

hySOLUTIONS GmbH

DB FuhrparkService GmbH

HAMBURG ENERGIE GmbH

Hamburger Hochbahn AG

HVV Hamburger Verkehrsverbund Gesellschaft mbH

Freie und Hansestadt Hamburg

Vattenfall Europe AG

Daimler AG

Project budget €**Subsidy amount €**

285,742

137,156

251,789

114,564

1,101,590

528,763

104,983

50,392

138,877

66,661

744,410

357,317

3,397,696

1,630,894

k. A.

211,019

The hh=more project includes the deployment of 50 battery-operated Smart electric drives as well as the construction of a public charging infrastructure. The public charging columns will be exclusively supplied with »green electricity« in order to exploit the climate advantage of electromobility. The battery-operated Smarts, aside from by project partners and external fleet customers, will also be deployed in car-sharing by Deutsche Bahn. The intermodal, or linked up transport usage which is thereby facilitated will be conceptually developed by

the mobility service providers HOCHBAHN, HVV, DB and SIXTI as the associated partners.

In the framework of the project under the auspices of the authorities for city development and environment, possible locations for charging columns/spaces in public areas will be sought, assessed and agreed upon. These charging spaces will be established and operated in the form of special usage by the energy suppliers HAMBURG ENERGIE and Vattenfall Europe.

PUBLIC CHARGING INFRASTRUCTURE

03 KOPA II - HAMBURG PURE

In the Hamburg PURE project 15 battery-operated Renault Kangoo ZEs are being deployed. Already belonging to the light commercial vehicle class, these vehicles will be used by Hamburg businesses in the trade, skilled crafts and logistics areas. The deployed vehicles can also use

the public charging infrastructure built in the model region, which will be guaranteed through the relevant technical tests.

Keyword	
hh=more Modul 4	
Recipients	
Renault Deutschland AG	
Project budget €	Subsidy amount €
2,952,920	1,476,460

GREEN POWER

04 KOPA II - HH=WISE

Keyword		
hh=more Modul 5		
Recipients		
hySOLUTIONS GmbH	Project budget €	Subsidy amount €
	129,416	64,708
Transporter und Wohnmobilmfachbetrieb Karabag GmbH	956,614	478,307

20 battery-operated Fiat Fiorinos from Hamburg's vehicle conversion firm Karabag will be deployed in the hh=wise project. The involvement of both chambers (Port Management and Logistics) as well as the authorities for city development

and environment, and the economy and employment in the framework of an associated partnership, guarantees broad participation and strategic integration of responsible actors for the development of Hamburg as an economic centre.



MODEL REGION BREMEN/ OLDENBURG

PROF. DR.-ING. MATTHIAS BUSSE, HEAD OF THE PROJECT HEADQUARTERS

What role does the generation of electricity from renewable wind energy have in the activities in the model region?

The electromobility model region Bremen/Oldenburg is characterised by its significant expansion of wind energy. This guarantees sustainable and »clean« electricity from renewable sources. The potential for an overall positive environmental balance from electromobility lies in the use of regenerative energy for the vehicles. This is certainly the right approach to ensure sustainable mobility for the future. With its wind cluster and offshore focus, this region is unique within Germany in terms of a sustainability strategy.

What about the public acceptance of electromobility?

Interest in electromobility is immense. One of the most commonly posed questions is: How can I take part in the programme? The expectations placed on the vehicle itself are high however, as e-cars are generally compared to those with conventional combustion engines. Despite having a smaller range, they hold up in comparison. The »spark« of enthusiasm usually is ignited swiftly. Test drivers are especially impressed that these cars produce neither noise nor emissions - yet provide genuine driving

pleasure. The acceleration of these vehicles is much faster than most expect. Test drivers have also provided feedback that the relatively lengthy recharging procedure can be quite easily integrated in their daily routine - either during the day while at work or overnight at home.

In what areas of application do you deploy electric vehicles?

The electric vehicles have been available to both commercial and private users within the framework of the fleet testing for several months. Applications range from deployment as a company car in a public authority to a service vehicle in a technology firm. But the researchers at Fraunhofer IFAM and DFKI aren't just looking at commercial use. The model region's »e-car4all« project has seen 14 vehicles put in the hands of private users. The project can be seen as »neighbourhood car-sharing« because users are required to share the vehicle with 3-5 other users (who are called »neighbours«). This concept has several advantages: firstly, you can reach a maximum number of users with a limited number of vehicles. In addition, this method allows a large spectrum of mobility scenarios to be covered while simultaneously enthusing many potential buyers of future electric vehicles.

Keyword

PMC Modul 1

Recipients

Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (FhG)

Deutsches Forschungszentrum für Künstliche Intelligenz GmbH

Project budget €

846,571

1,468,958

Subsidy amount €

846,571

1,395,510

The »Personal Mobility Center«, or PMC is the central starting point of the electromobility model region of Bremen/Oldenburg. The Fraunhofer Institute for Manufacturing Technology and Advanced Materials (IFAM) as well as the German Research Center for Artificial Intelligence (DFKI) have partnered together and through their vast experience in project and strategy development, have actively shaped the future of electromobility.

Service, consulting and public relations work are key to the PMC. The main focus of consulting are answering of technical, economic and legal questions. The skilled testing and assessment of business models and transport concepts with a focus on electromobility complete the service offer.

Companies, public transport operators, trade associations and private individuals can »experience« electromobility in the model region. Commuter vehicles, city cars, electric mopeds, e-bikes and pedelecs are available to cater for different mobility needs. Expert PMC staff coordinate the electric fleet so that the maintenance, care and the particularly important scientific monitoring of the project is managed. The progress reports and information gathered through data loggers will be systematically assessed and be channelled into the future strategies of the model region. All PMC activities focus on sustainability. The long-term establishment of a competence centre provides a market with enormous growth potential and skilled jobs which is not limited to the region itself.

ELECTRIC FLEETS FOR DIFFERENT MOBILITY NEEDS

Keyword

PMC Modul 3

Recipients

	Project budget €	Subsidy amount €
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (FhG)	600,000	600,000
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (FhG)	600,000	300,000
Deutsches Forschungszentrum für Künstliche Intelligenz GmbH	187,000	93,500
Deutsches Forschungszentrum für Künstliche Intelligenz GmbH	336,000	336,000
Move About GmbH	785,936	392,968

A requirement for the successful implementation of electromobility is to demonstrate the suitability of electric vehicles for everyday use. This aim is an integral part of the fleet tests being conducted in the Bremen/Oldenburg model region. In addition, the fleet tests will serve to acquire data that will feed into the »Intelligent Integration Electromobility« (Module 2) project.

The areas of focus in the fleet tests include the use of electric vehicles by commercial operators as well as the implementation of the »e-Car4all« private car-sharing model.

Within the framework of the fleet test with commercial users, various vehicle types will be made available to selected operators for a limited period in the model regions and integrated in daily operations. Meanwhile, the »e-Car4all« car-sharing model gives private users the opportunity to »discover« electromobility. Here, individuals obtain easy access to electric

vehicles for regular daily journeys. The cars will be distributed in residential areas and recharged and looked after by selected users. Private users are allocated one car that they can test and share with other users.

The acceptance of electromobility is promoted by giving diverse users and user groups the chance to become exposed to and familiar with this new type of vehicle technology and to enable the testing of vehicles that are still quite expensive to purchase privately. The model region headquarters oversees the deployment of the vehicles and the scientific analysis of the project is undertaken by the Deutsche Forschungszentrum für Künstliche Intelligenz (DFKI) GmbH (German Research Center for Artificial Intelligence) and the Fraunhofer-Institut für Fertigungstechnik und angewandte Materialforschung IFAM (Fraunhofer Institute for Manufacturing Technology and Advanced Materials).

CARSHARING

»E-CAR4ALL«

Electromobility combines applied research and development focusing on day-to-day and user-oriented demonstration with the goal of providing a boost to the national economy as laid out by the German economic stimulus package. A requirement for successfully establishing electromobility is the demonstration of e-vehicles in daily use. While the technical demands are largely already in place and have been impressively proven, the questions of developing this technology further and the applicability for end users, still remain. In this regard, the recharging infrastructure plays a decisive role for the sustainable establishment of e-mobility.

It is presumable that the development of a recharging infrastructure will not solely be dependent on technology, but to a substantial degree also shaped by the behaviour of e-vehicle users. Users' day-to-day experiences and their sense of safety could be decisive in this regard. Following a suitable analysis, it is therefore necessary to develop a needs-based infrastructure that takes both the technological possibilities and behaviour

of users into account, so that the trust and belief in e-mobility under everyday conditions is intensified.

To achieve this, fleets of electric vehicles will be deployed for testing under everyday conditions. Selected test users will conduct the trials. Besides investigating additional fields of business, data in the test vehicles will be recorded and evaluated. Particular attention will be placed on the charging/discharging profile of vehicle batteries and practical details concerning the recharging infrastructure. The aim is to develop a needs-based recharging infrastructure taking technical and user-dependent factors into account to promote and support e-mobility. A study has already been commissioned in this regard that evaluates locations for the construction of a recharging infrastructure. 30 charging stations will be constructed in the spring of 2011.

Keyword

PMC Modul 3

Recipients

EWE AG

Project budget €

3,149,110

Subsidy amount €

1,574,555

DEMONSTRATION OF EVERYDAY SUITABILITY

Keyword

PMC Modul 4

Recipients	Project budget €	Subsidy amount €
BAW Institut für regionale Wirtschaftsforschung GmbH	520,854	416,683
Deutsches Forschungszentrum für Künstliche Intelligenz GmbH	92,083	87,478
Jacobs University Bremen gGmbH	396,442	396,442
BIBA - Bremer Institut für Produktion und Logistik GmbH	226,932	226,932
OFFIS e. V.	226,049	226,049
Verein zur Förderung der wissenschaftlichen Forschung in der Freien Hansestadt Bremen e. V. (VFWF)	94,637	94,637
Freie Hansestadt Bremen - Der Senator für Umwelt, Bau, Verkehr und Europa	64,970	32,485
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (FhG)	57,904	57,904

This project will examine the socio-economic framework appropriate for making electromobility more attractive to individuals and companies, taking the perspectives of both the customer and the supplier into consideration. The first step involves identifying the components necessary for the usability of electromobility: building on the examination of regional mobility patterns and the technological characteristics of the electric vehicles (e.g. range), specific groups will be identified for whom electromobility is suitable. Their decision-making behaviour for the purchase of vehicles – or, in other words, the demand situation – will be depicted with the help of economic models. Furthermore, the supply side will be analysed from the company perspective to take into account the question of which business models show the most promise for electromobility and how the electromobility system can be embedded in

the regional value chain. The electromobility system hereby comprises the complete lifespan of the product and expands the perspective from a single core product to related activities that include all services surrounding electric vehicles. Transportation concepts and the regional infrastructure layout will also be investigated on the supply side, and recommendations will be provided for the sustainable shaping of these. With electromobility being promoted as an environmentally friendly technology, the aspects of what effect it has on emissions and which environmental costs are associated with it will be investigated along with the question of how electromobility and offshore wind energy interact. The suggestions resulting from this project will help to sustainably master the challenges expected through the introduction of electric vehicles in the model region.

REGIONAL VALUE CHAIN

A well-functioning local public transport system is an increasingly important part of public services and a key aspect of sustainable mobility. For example, on a per person basis during peak traffic periods, CO₂ emissions from conventional busses are only around 5% of those of a comparable car. Local public transport therefore makes a significant contribution to helping to protect the environment.

Rising energy prices and the finite availability of fossil fuels mean that raising energy efficiency further is a matter that is also becoming increasingly important for public transport operators. Hybrid technology will make an important contribution in this regard. The deployment of modern diesel busses with hybrid drives helps to reduce fuel consumption and thereby protects scarce resources while assisting in cutting emissions even further. In addition, the introduction of this form of electromobility enhances the overall appeal of public transport.

The project aims to test and develop today's »series hybrid technology«, with operation in line service sometimes run purely electrically. This will help drive the technology to market maturity and thereby enable a swift market introduction. The use of two hybrid busses on the routes of the Bremer Straßenbahn AG

(BSAG) will be examined with the framework of this project. The regional project headquarters of the Bremen/Oldenburg electromobility model region as well as the PMC (Personal Mobility Center), will oversee the vehicles' deployment.

The project encompasses the acquisition and integration of the hybrid busses within the existing BSAG fleet, along with equipping the vehicles with data loggers that register and record information on vehicle energy consumption while in day-to-day service.

As part of the Bremen/Oldenburg electromobility model region, the project is thereby making an important contribution to the themes and aims of the overall electromobility funding programme and the national electromobility developmental plan.

In addition to the deployment of the two hybrid busses, BSAG is also taking part in the Bremen/Oldenburg model region project as a user of two electric-drive passenger vehicles.

Keyword

PMC Modul 3

Recipients

Bremer Straßenbahn AG

Project budget €	Subsidy amount €
1,341,510	670,755

06 FURTHER PROJECTS

Keyword

KoPa II – PMC Modul 2

Recipients

	Project budget €	Subsidy amount €
Deutsches Forschungszentrum für Künstliche Intelligenz GmbH	1,670,371,58	1,586,853
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (FhG)	70,054	70,054
Freie Hansestadt Bremen – Der Senator für Umwelt, Bau, Verkehr und Europa	44,994	22,497

Keyword

KoPa II – PMC Modul 3

Recipients

	Project budget €	Subsidy amount €
swb AG	1,314,786	657,393
StadtAuto Bremen CarSharing GmbH	860,296	430,148
H2O e-mobile GmbH	673,624,79	285,819



MODEL REGION BERLIN/ POTSDAM

FRANK BEHRENDT, HEAD OF THE PROJECT HEADQUARTERS

What role does the funding programme play for the capital and its neighbour Potsdam?

With the help of a funding programme, practical projects were created in order to unlock the potential of electromobility in the capital city from a transport, energy, environment and city planning perspective and to determine political need for action towards strategic goals. New mobility services will be tested also to strengthen the Berlin/ Brandenburg region of science and research with the transport, mobility and logistics cluster.

What role does the electrification of commercial transport play?

Inner city delivery traffic is a primary cause of temporary local bottlenecks in the road network and is mainly responsible for local pollution concentration peaks, which is why the transport, energy and environment potential of electric vehicles will be demonstrated. The regulatory needs (e.g. extension of delivery times throughout the course of the day) will be highlighted, in order to be able to exploit this potential.

What message could the activities in Berlin send to other large cities?

The Berlin/Potsdam model region pursues an integrated approach which will demonstrate that the electric drive offers an ideal technological basis for sustainable mobility concepts in cities. Berlin is a test area for different mobility services and a pioneer for new business models, so that the capital region can be established as a nationwide platform for the development, testing and demonstration of electromobility in future-oriented transport applications.

Keyword

BeMobility

Recipients

	Project budget €	Subsidy amount €
DB FuhrparkService GmbH	4,964,441,76	2,258,821
Technische Universität Berlin	531,558	531,558
Robert Bosch Car Multimedia GmbH	861,083,72	370,266
RWE Effizienz GmbH	612,567,44	263,404
Innovationszentrum für Mobilität und gesellschaftlichen Wandel (InnoZ) GmbH	1,380,960	690,480
Contipark Parkgaragen GmbH	358,174,42	154,015
Vattenfall Europe AG	625,348,84	268,900
SOLON SE	299,856,25	143,931
HaCon Ingenieurgesellschaft mbH	482,926	241,463

1 million electric cars should be driving on roads in Germany by 2020. Electric cars can decrease emissions in cities. Regenerative charging electricity supports the climate balance and reduces dependency on oil. The comparatively low ranges and high purchase costs of electric cars currently stand in the way of wider expansion. In addition, electric cars do not reduce land consumption and volume of traffic.

BeMobility is therefore developing integrated mobility concepts for dense urban areas. Public transport plays an important role here. Embedded in a multimodal mobility concept, users can best utilise different means of transport: electric cars on the road for short-term rental complement public local and long-distance transport.

The core of BeMobility is the integration of e-cars and pedelecs in public transport. Furthermore, user-friendly connections and further development of information systems, tariffs and chains of distribution are affected. The customer should be facilitated with an easy transition between these modes of transport.

It will be assessed whether an integration is

- feasible both technically and in terms of urban development,
- is in demand and
- will complement public transport.

Approximately 40 electric cars and pedelecs will gradually come into operation and investigations into customer acceptance and business models carried out in parallel.

INTEGRATED MOBILITY CONCEPTS FOR CONGESTED URBAN AREAS

Keyword

Konzept Ton EM

Recipients

Angelo D'Angelico

Project budget €

165,025

Subsidy amount €

132,020

Electrically operated cars and commercial vehicles have considerably lower noise emissions than conventional vehicles. In addition completely new and low-noise electrically operated means of transport are available in public space prior to registration. Aspects such as brand communication through the omission of brand-typical engine sounds will also play a role in the consideration of e-mobility. In this context, different aspects will be examined in the AUE-Mobility project:

The assessment of risk potentials:

- Analysis of sources of danger in street traffic, which are brought about by low-noise e-vehicles
- Implementation of noise measurements of different vehicles in the model region
- Analysis and compilation of a facts database of the actual risk potential
- Discussion of measures to reduce risks

- Technical development of signal transmitters for especially endangered participants of street transport
- Development of perspectives for future city planning in a reduced emissions environment

Development of new 'soundscapes':

- Design and creation of new vehicle sounds for automotive brands

An important component of the project is the online survey on personal risk assessment of low-noise travel.

E-CITY LOGISTICS

Keyword

KEP

Recipients

Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (FhG)

Project budget €

775,673

Subsidy amount €

775,673

Meyer & Meyer Transport Services GmbH

483,746

241,873

Deutsche Post DHL Market Research & Innovation GmbH

626,730

313,365

The goal of E-City-Logistics is to demonstrate the transport, operating as well as the energy and environmental potential of electrically operated commercial vehicles in inner city delivery traffic. The logistical and regulatory design requirements will be highlighted in order to be able to exploit the potential involved. The transport potential lies especially in the expansion of dawn/dusk delivery made possible by electric vehicles, which could lead to a more balanced schedule of delivery traffic. For this purpose two field trials will be carried out:

- The main goal of the KEP Demonstrator (Kurier-Express-Paket, or express messenger package) is to speed up the introduction of electrically operated delivery vehicles in inner city delivery transport, as conventional vehicles generate above average emissions in highly populated urban districts through frequent stops.

- In the second field trial the deployment of 11t electric commercial vehicles will be assessed in the area of textile logistics (deliveries to branches) in Berlin's inner city. Aside from the expected decrease in emissions (air pollutants and noise emissions) it is a particular goal to increase the cost-effectiveness of electric vehicles through appropriate logistical concepts. Aside from the vehicle-related technical characteristics, the potential of adapted logistics in combination with regulatory instruments will be ascertained.

LOW-NOISE TRANSPORT MODES

04 FURTHER PROJECTS

Keyword

KoPa II - Potentials for environmental relief

Recipients

Öko-Institut e. V.

Project budget €

345,226

Subsidy amount €

345,226



MODEL REGION RHINE-RUHR

DR. ANDREAS ZIOLEK, HEAD OF PROJECT HEADQUARTERS

The Rhine-Ruhr region is one of Germany's largest urban agglomerations with an immense volume of traffic. What influence can electromobility have to alleviate the situation?

The terms »new transport concepts« and »intermodal transport« are often uttered in connection with electromobility. It is clear that an idle substitution of »conventional« vehicles with e-vehicles will not be sufficient to eliminate the environmental and congestion problems of large urban centres. But electromobility does provide significant opportunities for a number of reasons, especially with regard to shifting private transport to public carriers. Furthermore, innovative commercial vehicles (e.g. hybrid refuse collection trucks or emission-free city logistic vehicles) in the areas of freight and logistics provide interesting approaches to reducing pollutant emissions in the inner city.

What role does local public transport play in the activities of the model region?

A more effective and environmentally friendly local public transport system forms the backbone of so-called intermodal transport solutions for inner city and commuter transport. The consistent linkage of local public transport with

other customised transport options, such as car sharing concepts at transport hubs, or other public transport innovations, will continue to increase the acceptance of public transport. A priority of project activities in the model region involves assessing what has already been achieved in comprehensive, broad trials and what still needs to be undertaken - thereby providing R&D with important stimuli for continued work.

To what extent is safety a challenge for the recharging infrastructure and e-vehicles to pave the way for the introduction of electromobility?

Safety, both in terms of the recharging infrastructure and the vehicle itself is of vast importance. An e-vehicle must comply with at least the same safety standards as a car with a conventional drive. For this reason, all model regions are working together to promote safety research and are developing a concept, in conjunction with renowned institutes and industry, that describes the demands for charging and operating safety of batteries and e-vehicles.

Keyword

colognE-mobil

Recipients

Ford-Werke GmbH

Project budget €

10,847,212

Subsidy amount €

4,664,301

Universität Duisburg-Essen

1,546,699

1,546,699

RheinEnergie AG

2,248,196

1,124,098

Stadt Köln

210,000

210,000

The colognE-mobil field test distinguishes itself from many other electromobility projects through »city-Logistik«, focusing on aspects like battery life, the analysis of daily vehicle use as well as the acceptance of electromobility. The project consortium comprises the partners Ford-Werke GmbH, RheinEnergie AG, the City of Cologne as well as Duisburg-Essen University. Ford will initially make ten Ford Transits and ten Transit Connects available to selected companies.

Ford is also responsible for the management of zero emission commercial vehicles as well as the analysis of customer expectations. RheinEnergie AG is delivering carbon neutral operating energy for vehicles from renewable sources and pri-

marily deals with the issue of »electricity as a fuel« as well as all related infrastructural and customer product development. The city of Cologne is participating in the model test in terms of inner city integration of electromobility.

Thereby a main emphasis is put on the effects on the city's climate and noise protection targets as well as with regard to safety aspects in street traffic. The Duisburg-Essen University is undertaking the scientific accompaniment of the project. It makes simulations for the dimensioning of batteries and other components, conducts large-scale acceptance tests and market research examinations and delivers statements on the requirements for future electricity infrastructure for electromobility.

DRIVE ENERGY FROM RENEWABLE SOURCES

Keyword

KoPa II - Stromschnelle

Recipients

	Project budget €	Subsidy amount €
RWE Effizienz GmbH	6,784,530	3,392,265
Renault Deutschland AG	5,532,990	2,766,495
Rheinisch-Westfälische Technische Hochschule Aachen	396,259	396,259
fka Forschungsgesellschaft Kraftfahrwesen mit beschränkter Haftung Aachen	561,974	280,987

The project partners RWE Effizienz GmbH, Renault Deutschland AG, Forschungsgesellschaft Kraftfahrwesen mbH Aachen (fka) and the Institut für Hochspannungstechnik der RWTH Aachen are together examining the »electric commuter traffic between Rhine and Ruhr« in practice. The coordination takes place centrally through the project headquarters Energie-Agentur.NRW. The Federal Ministry for Transport, Building and Urban Development (BMVBS) supports this particular project with around 7 million euro in the framework of the Electromobility Model Regions.

The vehicle fleet consists of 40 pre-series electric vehicles from Renault as well as 110 converted electromobile cars, which RWE provides as leasing vehicles. Renault will provide the commercial vehicle models Kangoo Rapid Z.E. for this purpose and the mid-class limousine Fluence Z.E., which will be serially introduced in Europe from 2011 already after the end of the support programme. Both models have a range at the market launch already of over 160 kilometres and can be charged by standard loading, fast charging or battery replacement.

The RWE leasing vehicles based on Fiat 500, the so-called Karabag 500 E, are equipped with modern lithium-ion batteries. Models based on the Fiat Fiorino are also deployed. With a range of between 100 and 140 kilometres, they are perfectly suited to urban transport.

The goal of the joint project is the integration of electromobility in everyday commuter traffic along the city chain of the A40. Even in this conurbation, with its frequent congestion or traffic jams, these clean and quiet e-vehicles can prove their strengths perfectly. With focus on the cities of Mülheim, Essen and Dortmund, RWE will build up an area-wide recharging infrastructure until mid 2011. Furthermore, data will be collected which will facilitate the development of more marketable products, like navigation equipment with more convenient charging station overview and route planning. Through this the project participants wish to further advance the necessary research and development of electromobility. The project will be intensively accompanied, examined and evaluated in terms of research.

SUSTAINABLE MOBILITY CONCEPTS BASED ON ELECTROMOBILITY

Keyword

E-Aix Cross section

Recipients	Project budget €	Subsidy amount €
Stadtwerke Aachen AG	922,248	461,124
Innovationszentrum für Mobilität und gesellschaftlichen Wandel (InnoZ) GmbH	188,700	94,350
fka Forschungsgesellschaft Kraftfahrwesen mit beschränkter Haftung Aachen	224,612	112,306
Stadt Aachen	311,615	249,292
Rheinisch-Westfälische Technische Hochschule Aachen	1,208,239	1,208,239

Keyword

E-Aix NFZ

Recipients	Project budget €	Subsidy amount €
fka Forschungsgesellschaft Kraftfahrwesen mit beschränkter Haftung Aachen	601,012	300,506
WZL Aachen GmbH	7,800	7,800
Hans Hess Autoteile GmbH	159,320	79,660
Stadt Aachen	97,978	34,694
EcoCraft Automotive GmbH & Co. KG	102,618	51,309
Stadtwerke Aachen AG	41,053	12,472
HOPPECKE Advanced Battery Technology GmbH	122,122	61,061
Rheinisch-Westfälische Technische Hochschule Aachen	229,302	229,302

Keyword

E-Aix Two-wheeler

Recipients	Project budget €	Subsidy amount €
Stadtwerke Aachen AG	471,383	220,230
Hans Hess Autoteile GmbH	159,320	79,660
DB Rent GmbH	550,732	250,583
Stadt Aachen	69,509	55,607
Rheinisch-Westfälische Technische Hochschule Aachen	29,167	29,167

The project partners want to develop, research and implement sustainable electromobility-based mobility concepts in a comprehensive feasibility study. The models for mobility, infrastructure and transport development therefore take in account two-wheelers, four-wheeled vehicles, commercial vehicles as well as electric busses for public transport. An »electromobility world of experience«, developed jointly by research, industry and local authorities will facilitate early user acceptance through explanation and demonstration. Ten consortia from research and development, local authorities as well as industry have joined together with a total project volume of approx. 5.8 million euro.

The research project focusses on three priorities: the »Interface project« deals with the effects of electromobility on the energy grid, on the regional traffic situation and on urban infrastructures. A transferable procedure model taking the example of the Aachen region will thereby be developed, checked against the integrated research findings from the sister project of the BMWi »Smart Wheels«. In the »Two-wheeler« project, it is planned to establish a leasing system with up to 100 so-called pedelecs, and to implement the operation of battery changing systems on a rolling basis. The »User vehicle« project includes seven small electric transporters into field trial.

04 KOPA II – ACCOMPANYING RESEARCH FOR THE DEPLOYMENT OF HYBRID LINE SERVICE BUSES IN THE RHINE-RUHR TRANSPORT ASSOCIATION

Keyword

VRR-Hy-Research

Recipients

Rheinisch-Westfälische Technische Hochschule Aachen

TÜV NORD Mobilität GmbH & Co. KG

Verkehrsverbund Rhein-Ruhr AöR

Project budget €

422,318

405,957,54

288,918

Subsidy amount €

422,318

185,482

144,459

In the efforts for a rapid market introduction and expansion of alternative drive technologies, local public transport plays a major role as an innovation driver. In the framework of its investment incentive the Verkehrsverbund Rhein-Ruhr (Rhine-Ruhr transport association) in 2010 is funding the procurement of 21 hybrid busses for 10 transport companies. The deployment of hybrid busses from five different manufacturers will be supervised in the framework of one of the Federal Ministry for Transport's electromobility model regions research programmes by the Institut für Kraftfahrzeuge (Institute for Motor Vehicles) of the RWTH Aachen University, the TÜV Nord and the Verkehrsverbund Rhein-Ruhr (Rhine-Ruhr transport association). Apart from the assessment of fuel-saving capacity

on the basis of line- and vehicle-related recording of refueling data through the transport companies, the content of the accompanying research is also an intensive measuring initiative to investigate exhaust fumes and noise emissions in scheduled bus services compared to conventional reference vehicles. On the basis of the measurement results as well as fuel consumption simulations carried out in parallel, statements can ultimately be made about which drive concepts are suitable for which application profiles. All project participants hope for further useful results through conducting surveys of passengers, passers-by and drivers. The results yielded from measurements and surveys will be made available by manufacturers together with proposals on further optimisation of technologies.

PUBLIC TRANSPORT AS AN INNOVATION DRIVER

05 FURTHER PROJECTS

Keyword

KoPa II – Hybrid refuse collector

Recipients

GSAK Gesellschaft für Stadtreinigung und Abfallwirtschaft
Krefeld mbH & Co. Kommanditgesellschaft

Project budget €

1,081,588

Subsidy amount €

540,794

Keyword

KoPa II – Gelenk-KOM

Recipients

Bochum Gelsenkirchener Straßenbahnen AG

Project budget €

254,374

Subsidy amount €

131,384

06 KOPA II – RESEARCHERS FROM THE UNIVERSITY OF BOCHUM TEST ELECTRIC VEHICLES IN EVERYDAY CONDITIONS AND DESIGN BASIC STRATEGIES FOR THEIR FUTURE COMPREHENSIVE DEPLOYMENT

Keyword

Technologie-Roadmap

Recipients

Ruhr-Universität Bochum

Delphi

Project budget €

487,752

125,228

Subsidy amount €

487,752

62,614

A trial fleet of six vehicles will be on the roads from December 2010. They will be tested by 50 volunteers of varying vehicle driving habits. The researchers will examine driving operation and charging procedure. In addition the vehicles will regularly be examined in order to learn more about the energy efficiency of the vehicle, the efficiency of the drive train and the interaction between the battery system and the electro-mechanical drive system. Vehicles will be deployed which are charged in one step via the normally used 16A charge as well as through direct current charging with 125A of power from the electric energy supply grid.

The goal is to formulate concrete technical and functional requirements for future electric vehicles and their sub-systems. Young engineers will also benefit from this know-how.

In future the specialist expertise of electrical engineering, engineering, economics and social sciences at this university on the Ruhr will be pooled and the electromobility research field illuminated from different perspectives.

With the Technology Roadmap, SMEs are getting the opportunity to be able to develop and market competitive sub-systems for the newly existing electromobility market, without already failing during the run-up to a cost-intensive need for research.

ENERGY EFFICIENCY

07 FURTHER PROJECTS

Keyword

KoPa II – EMobil-NRW

Recipients

Stadtwerke Düsseldorf AG

Wuppertal Institut für Klima, Umwelt, Energie GmbH

Landeshauptstadt Düsseldorf – Stadtbetrieb Zentrale Dienste

Drive-CarSharing GmbH

Lufthansa Technik AG

Stadtwerke Brühl GmbH

Stadtwerke Emmerich GmbH

Stadtwerke Fröndenberg GmbH

Stadtwerke Hilden GmbH

MEGA Monheimer Elektrizitäts- und Gasversorgung GmbH

Energieversorgung Oelde GmbH

Stadtwerke Schwerte GmbH

Project budget €

1,560,230

315,186

121,500

45,368

24,054

56,656

49,236

77,948

72,876

63,926

64,918

37,930

Subsidy amount €

780,115

315,186

60,750

22,684

12,027

28,328

24,618

38,974

36,438

31,963

32,459

18,965



MODEL REGION SAXONY

CATHLEEN KLÖTZING, HEAD OF THE PROJECT HEADQUARTERS

Affordable, high-performance batteries are an essential prerequisite for the broad introduction of electromobility – to what extent will the issue of energy storage technology be considered in the Saxony model region?

Companies along the entire value chain of lithium-ion batteries are to be found in Saxony – from the production of raw materials and manufacture of cells to battery packaging. The establishment of a development and test centre for HOPPECKE energy storage systems is particularly impressive. The goal is to develop modular, economic and competitive energy storage systems for the industrial market, which has not been commercially available in sufficient supply up to now.

What are the challenges of using hybrid busses in public transport in Dresden and Leipzig?

In the framework of the SaxHybrid, 20 serial hybrid busses will be deployed in line service in Dresden and Leipzig. These fleet trials are necessary in order to optimise the drive trains in such a way as to make the vehicles com-

petitive compared to diesel busses and for them to reach market maturity. The deployment in two very different topographical cities serves to prove that different configurations of fast-charging hybrid drives on varying line profiles are also necessary.

Electric vehicles are particularly suitable for use in vehicle fleets – what issues should be looked out for regarding vehicle procurement, fleet operation and fleet management?

The procurement of suitable electric vehicles for company fleets is still difficult, although more and more manufacturers are now bringing their models to market. In the deployment of electric vehicles in fleets, special attention must be paid to the reduced ranges compared to conventional vehicles as well as the charging time between journeys. Despite these adverse framework conditions, one of the goals of SaxMobility is to achieve optimal integration of vehicles in company fleets.

The goal of the current project is the development of modular, efficient and competitive energy storage systems using lithium and NiMH technology for the industrial market. Thereby long-standing knowledge in battery construction will be used to develop both efficient production technology for the integration of commercial cells of different dimensions and electrochemical composition.

The market segment of electric drive battery systems, already exploited by HOPPECKE (currently in lead-acid as well as alkaline technology (NiCd)), thereby constitutes an essential application area in the framework of electromobility for the bus drives area in public transport as well as for special vehicle areas. This

should lead to a lithium/NiMH overall system through the system integration of higher energy and performance cells with appropriate battery management. This development is already driven by existing customer requirements and operators who will test this innovative system in the future demonstration phase.

To establish the validity of the development concept of the construction of modular energy storage and the flexible production process, a small series production is planned to be carried out which will be tested within a fleet test (electromobility model region).

Keyword

Process technology

Recipients

HOPPECKE Advanced Battery Technology GmbH

Project budget €

5,137,572

Subsidy amount €

2,568,786

EFFICIENT PRODUCTION TECHNOLOGY

Keyword

SaxHybrid

Recipients

	Project budget €	Subsidy amount €
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (FhG)	319,006	319,006
Dresdner Verkehrsbetriebe AG	4,105,532	2,052,766
Leipziger Verkehrsbetriebe (LVB) GmbH	4,006,082	2,003,041

Public transport in urban traffic in the bus sector will also be considerably strengthened over the long term through electric drives in order to adhere to local emission limits on exhaust gasses and noise. The first interim step towards this development is hybrid busses which facilitate the recuperation of kinetic and potential energy. The overall and long-term goal of the project is the future operation of purely electrically operated busses. The focus of transport system-related investigations is the electrical energy supply at bus stops. In the framework of the build-up of environmentally-sound local transport, 20 hybrid articulated busses will be deployed in the cities of Dresden and Leipzig. In the course of the deployment of the hybrid busses the energy requirement and the recuperated amount of energy as well as the potential for improvement of the energy

balance will be registered and measured. Based on the findings the statistically significant connections concerning deployment profile, vehicle occupancy, energy consumption and the local, capacitive and time scale required for external electric energy supply system will be deduced. From these results the custom-made advancement of drive trains and storage media will be transferred to rechargeable hybrid systems. The requirements for externally rechargeable hybrid vehicles in different transport and topographical areas of application will be examined through the deployment of hybrid busses in Dresden and Leipzig. The project management will be implemented by VerkehrsConsult Dresden-Berlin GmbH. The scientific accompanying research will be carried out by the Fraunhofer Institute for Transportation and Infrastructure Systems IVI in Dresden.

DEVELOPMENT OF ENVIRONMENTALLY SUSTAINABLE LOCAL TRANSPORT

Keyword

SaxMobility

Recipients

	Project budget €	Subsidy amount €
KEMA – IEV Ingenieurunternehmen für Energieversorgung GmbH	340,528	170,264
Stadtwerke Leipzig GmbH	517,066	258,533
Hochschule für Telekommunikation Leipzig (FH)	319,402	319,402
LTB Leipziger Transport und Logistik Betriebe GmbH	727,474	363,737
DREWAG – Stadtwerke Dresden GmbH	475,622	237,811
ENSO Netz GmbH	240,956	120,478
Hochschule für Technik und Wirtschaft Dresden	308,549	308,549

The SaxMobility project deals with testing electromobility under real operating conditions in several company vehicle fleets in combination with a partial publicly accessible recharging infrastructure in urban and rural space. In this context aspects of grid connection, public access, measurement, invoicing and communication for fleet systems together with several fleet bases will be observed. The content of the project is the creation of a publicly accessible recharging infrastructure and deployment of fleet electric vehicles to business areas with high internal user potential and at the same time to locations attractive to the public. Furthermore the development of a concept to convert company fleets to e-vehicles is planned as well as different models for a step-by-step build up of recharging infrastructure and its grid compliant operation. The results

of the pilot project provide information on the burden on the grid and billing options, and constitute the foundation for the broad introduction of infrastructure of recharging stations and vehicles in the cities of Leipzig and Dresden as well as their environs. With an appropriate and flexible arrangement of the system in terms of provider choice, paths to user identification and recharging management make new business models possible.

With the launch of electric vehicles in company fleets, firms emphasise its pioneering role in implementation of environmental goals. Current information on the pilot project can be found at www.sax-mobility.de.

INTRODUCTION OF ELECTRIC VEHICLES IN COMPANY FLEETS



MODEL REGION RHINE-MAIN

VOLKER LAMPMANN, HEAD OF THE PROJECT HEADQUARTERS

The Rhine-Main region constitutes a central hub for rail, road and air transport in Germany. How will these transport routes be linked within the framework of electromobility?

The Rhine-Main area possesses an extremely well interconnected transport system in which electromobility is already integrated in diverse areas through our project partners. This includes commercial and delivery vehicles in the inner city, company vehicles, and even a large number of Pedelecs that are used as an alternative to motorised commuter transport. A further tangible example where the linking of existing transport systems with electromobility can be found is in a German Railways (Deutsche Bahn) project in partnership with local energy suppliers. Here electric cars are provided at selected main railways stations in the model regions, thereby providing a transport link to long-distance travel. Meanwhile, on a local inner city level, the »Linie 103« project will achieve similar linkages in the city of Offenbach.

What role do innovative car-sharing concepts play in the introduction of electromobility?

Innovative car-sharing concepts play an extremely im-

portant role in the application of electromobility. These types of systems allow electric vehicles to be sensibly integrated. They readily facilitate mobility to be adapted to individual needs and wishes within an existing system of public mobility. Users of conventional car-sharing systems are generally already very open towards innovation and new technologies. We are therefore very optimistic that in this respect, the barriers to trying out e-vehicles will be few and far between. Simultaneously, with the purchase of private e-vehicles currently still quite costly, e-car sharers can gain early access to such innovative vehicles.

What is the environmental contribution of the electrification of transport?

Naturally, we hope that through the electrification of transport we will achieve a significant reduction of exhaust emissions in the inner city over the medium term. We also expect that noise levels will also ease: electric vehicles are considerably quieter compared to their conventionally-driven counterparts. This development not only enhances the quality of life in the heavily affected cities but also across the entire region.

01 KOPA II – ELECTROMOBILITY FLEET TRIALS, UPS GERMANY

UPS is testing five electric delivery vehicles in the framework of the »Electromobility Model Regions« in different city centres in the state. These have already travelled over 43,000 kilometres in everyday use in the year 2010. In the comparative trial, results concerning optimal tour parameters for the use of electrically operated vehicles will be gathered – in light of existing capacities and range limitations. In addition, preconditions for a medium-term profitable deployment of electric commercial vehicles in delivery operation will be defined. In the everyday operation of (almost noiseless) electric vehicles, much importance will be placed on transport safety.

In order to further develop electrically operated commercial vehicles in a target-oriented manner, special focus must be put on the optimisation of technical-construction aspects. With a successful introduction into the local transport networks, a major area of business transport can be accessed for electromobility. Local delivery traffic constitutes an ideal area of use for electrically operated commercial vehicles, if we are able to make the technology more economically competitive and as reliable as conventional drives.

Keyword

UPS

Recipients

United Parcel Service Deutschland Inc. & Co. OHG

Project budget €	Subsidy amount €
216,550	108,275

BUNDLING COMPETENCES

02 KOPA II – INFRASTRUCTURE, CHARGING STATIONS AND THE »LIVING AND MOBILITY« PROJECT FOR ELECTROMOBILE PASSENGER CARS, MOPEDS AND PEDELECS IN FIELD TRIAL

Keyword

Mainova

Recipients

Mainova AG

ABG FRANKFURT HOLDING Wohnungsbau- und Beteiligungsgesellschaft mbH

Project budget €	Subsidy amount €
556,752	278,376
301,058	150,529

The two significant Frankfurt companies from the energy and construction industry, Mainova AG and ABG FRANKFURT HOLDING, are pooling their competences in order to spread electromobility in the Rhine-Main area. Within the research project coordinated by AGBnova, field trials will be carried out for the build-up of infrastructure for electromobile passenger cars, mopeds (e-mopeds) and so-called pedelecs (pedal electric cycle) for the selection and development of future-oriented charging stations and accounting systems.

For the build-up of a charging infrastructure for electric passenger cars in Frankfurt am Main, the so-called Frankfurt model will be implemented for public street space. The purposely

open design concept uses already existing infrastructure of roadside pay-and-display machines and of manual paystations in car parks for the paying and activation of charging stations. The user can interlink parking and charging without previous notification or agreement. Payment takes place in a single transaction. Aside from the development of infrastructure, a further aspect will be examined, namely the use of e-vehicles in the companies' own vehicle fleets. In the two-wheeler area, the use of pedelecs will be tested. These field trials help the examination of the conflation of the »Living and Mobility« life areas. This will take place during the first test phase through long-term individual use. In the second phase this combining will be tested using the example of a pedelecs sharing system.

Keyword

Green Mobility

Recipients

	Project budget €	Subsidy amount €
HEAG mobilo GmbH	1,122,174	561,087
Technische Universität Darmstadt	418,529	418,529
VDL Bus & Coach Deutschland GmbH	901,950	450,975
Vossloh Kiepe GmbH	603,400	301,700

The Darmstadt transport company HEAG mobilo together with project partners Technische Universität Darmstadt (Field of Regenerative Energy, Prof. Dr. Hartkopf, and Chair in electric energy energy conversion, Prof. Dr. Binder) as well as the manufacturers of lightweight construction buses VDL Bus & Coach and the electrical component manufacturers Vossloh Kiepe, are testing three hybrid buses from early 2011. The buses and the simulatively developed models will be tested initially without passengers in Darmstadt on the inner city L line, and later in passenger service.

The goal is the reduction of environmentally-damaging emissions in urban areas (less noise, less harmful emissions) as well as improved competitiveness of hybrid buses through the further development of hybrid technology.

Further sub-objectives:

- Optimisation of engine and charging management of hybrid buses through the development of simulation models as well as simulative integration of future storage technologies and inductive recharging
- Improvement of the drive train through the discovery of potential for efficiency increases
- Development of algorithms for simple adaptation of hybrid buses to the operational requirements of transport companies
- Development of a driver assist system for low consumption driving

FURTHER DEVELOPMENT OF HYBRID TECHNOLOGY

04 KOPA II – COMMUNAL VEHICLES WITH HYBRID DRIVE TO REDUCE EMISSIONS

A long-term experiment will be carried out using a hybrid refuse collection vehicle under real operating conditions from February 2011, in order to calculate the long-term reliability and the related operating costs of such a vehicle. Significant fuel savings and reduced noise emissions are anticipated. Because of this, a significant contribution can be made towards reducing the inner city emissions burden.

Through this field trial the applicability of this environmentally-friendly vehicle technology in the commercial area can be assessed and the need for further development and improvement established. The practical trial will establish what infrastructure is necessary for the deployment of this vehicle technology. In particular it will be evaluated what requirements concerning local workshops for the repair and maintenance of this vehicle exist.

In addition:

a) With the Frankfurt am Main University of Applied Sciences, Nibelungenplatz 1, 60318 Frankfurt am Main, the following sociological policy issues will be examined:

- How does the new technology affect the jobs of drivers, fuel station attendants and the car workshop mechanics? What are the experiences of affected workers, how satisfied are they with the new vehicle?
- How will the deployment of the new technology be viewed by the population: the customers?

b) With Fraunhofer IWES, Koenigstor 59, Kassel, the following technical policy issues will be assessed:

- Evaluation of the technical measurement results for further scientific application

As a further result of the practical trial the financial effects of the creation and deployment of this new drive technology will be shown. These findings will be compared with the experiences from the entire conventional fleet. From this the savings or the representative additional costs of hybrid technology compared to the use of conventional technology will be deduced.

Keyword

Hybrid communal vehicle

Recipients

ESO Offenbacher
Dienstleistungsgesellschaft mbH

Project budget €	Subsidy amount €
218,534	109,267

05 KOPA II – PILOT: PEDELECS – IDSTEINER LAND ON TOUR

Keyword

E-Bike

Recipients

Süwag Energie AG

Storck Bicycle GmbH

Project budget €	Subsidy amount €
847,138	423,569
440,950	220,475

Mobility is an indicator of quality of location and life – and quality increases when the environment is protected. Suewag Energie AG is therefore promoting electromobility: e.g. in model regions like PILOT: PEDELECS – IDSTEINER LAND ON TOUR. This project is about the demonstration and integration of

e-bikes (pedelec) in the Rhine-Main model region as well as the development of standard fuelling stations and optimised pedelec-drives with the associated partner (Fa. Storck Bicycle GmbH). The mobility behaviour under everyday conditions will thereby be supported and strengthened.

06 NIP – DEMONSTRATION OF A HYBRID RAIL VEHICLE AND PROOF OF TECHNICAL SUITABILITY FOR EVERYDAY USE

Keyword

Hybrid rail vehicle

Recipients

MTU Friedrichshafen GmbH

DB RegioNetz Verkehr GmbH

Project budget €

2,949,170

1,163,541

Subsidy amount €

1,415,602

558,500

The Tognum subsidiary MTU Friedrichshafen GmbH and the Deutsche Bahn subsidiary DB RegioNetz Verkehrs GmbH West Frankenbahn are together developing and testing a railcar with a hybrid drive. In the second half of 2011 a prototype from the hybrid powerpack developed by MTU will be tested for the first time in Europe in a local transport railcar of the 642 building series on the route between Aschaffenburg to Miltenberg. Ingo Lehmann, MTU project leader, summarises the immediate project aim thus: »We are pioneers with this project. We want to show that the clean drive will save even more through hybrid technology. That protects the environment and at the same time, the budget of the operator.« The vision and sustainability behind the joint project is explained by Claus Werner, Deutsche Bahn project leader: »This is a first significant step towards emission-free rail transport.«

The hybrid powerpack is an under-floor drive that retrieves back energy during braking and uses it for restarting and stop-and-go operation. As a parallel hybrid it can be run either with a diesel engine, electric engine, or a diesel-electric combination. This way fuel consumption and carbon dioxide emissions can be reduced by up to 25 percent. This technology facilitates a low-noise and low-emissions rail operation in train stations or on inner city routes. It is especially efficient on local routes with frequent braking and acceleration. DB System Kassel carries out the required engineering service for changes to the vehicle, and the total conversion of the vehicle takes place in the vehicle maintenance centre of Deutsche Bahn in Kassel. The testing of the hybrid railcar is supported by the Federal Ministry of Transport, Building and Urban Development (BM-VBS) in the framework of the Electromobility Model Regions Programme, which is coordinated by NOW GmbH National Organisation Hydrogen and Fuel Cell Energy.

07 FURTHER PROJECTS

Keyword

KoPa II – SOH fuelling stations

Recipients

Stadtwerke Offenbach Holding GmbH

Project budget €

230.706

Subsidy amount €

115.353

Keyword

KoPa II – bike + business 2.0

Recipients

Planungsverband Ballungsraum Frankfurt/Rhein-Main

Project budget €

986.441

Subsidy amount €

532.678

Keyword

KoPa II – IWES

Recipients

Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (FhG)

Project budget €

673.897

Subsidy amount €

673.897

Keyword		
KoPa II - EVOmotion		
Recipients	Project budget €	Subsidy amount €
Energieversorgung Offenbach AG	908,082	454,041
Keyword		
KoPa II - NEMO		
Recipients	Project budget €	Subsidy amount €
Städtische Werke AG	573,892	286,946
Keyword		
Door-to-door mobility in long-distance transport		
Recipients	Project budget €	Subsidy amount €
DB FuhrparkService GmbH	369,923	168,315
Keyword		
KoPa II - MOREMA		
Recipients	Project budget €	Subsidy amount €
juwi R & D Research & Development GmbH & Co. KG	2,101,914	1,050,957
Keyword		
KoPa II - Hybrid communal vehicle		
Recipients	Project budget €	Subsidy amount €
Eigenbetrieb Abfallwirtschaft und Stadtreinigung der Stadt Darmstadt (EAD)	457,618	228,809
Technische Universität Darmstadt	80,507	80,507
Keyword		
KoPa II - 103 line		
Recipients	Project budget €	Subsidy amount €
Offenbacher Verkehrs-Betriebe GmbH	529,000	264,500
Rhein-Main-Verkehrsverbund GmbH (RMV)	405,920	202,960
Engel Elektromobile GmbH i. G.	289,260	231,408
Keyword		
KoPa II - Social Research		
Recipients	Project budget €	Subsidy amount €
Fachhochschule Frankfurt am Main - University of Applied Sciences	239,451	239,451
Johann Wolfgang Goethe-Universität Frankfurt am Main	274,123	274,123
e-hoch-3 GbR	106,450	85,160
Keyword		
KoPa II - Experiencing the future (ZUKUNFT erFAHREN)		
Recipients	Project budget €	Subsidy amount €
Verein für Ökologie, Gesundheit und Bildung e. V.	237,246	237,246
Keyword		
KoPa II - Product acceptance (Wartungsdiagnose)		
Recipients	Project budget €	Subsidy amount €
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (FhG)	216,566	216,566
ALL4IP TECHNOLOGIES GmbH & Co. KG	184,353	147,482



REGION OF STUTTGART MODEL REGION

HOLGER HAAS, HEAD OF THE PROJECT HEADQUARTERS

What impact will the introduction of electromobility have on future town planning and urban design?

The challenges for town planning are akin to the technical challenges that must be overcome in the vehicles themselves. Just one example: town planners are not thrilled that the best inner-city parking spots are occupied by e-vehicles for hours at a time while charging. Meanwhile, those developing the recharging infrastructure cannot understand that someone might have an objection to the smartly-designed charging stations. It is very exciting to be in a position where we help shape this discussion with our contributions.

The roots of the automobile lie in Stuttgart and its surrounding regions. What effects will the introduction of electromobility have on the prevailing mobility structures?

It goes without saying that we, as the business development agency of the Stuttgart region where 180,000 people are employed within the automotive cluster, are keeping a close eye on the structural changes currently occur-

ring. How does the value chain in the automotive industry change when the scales shift from combustion engine to electromobility? Much is currently in a state of flux. An important task is to help suppliers master this structural change.

What role do electric two-wheelers such as pedelecs and e-scooters play in the success of electromobility?

We are convinced that two-wheelers will be key to broadening public acceptance of electromobility. This has been the case in China for several years, where e-bikes and pedelecs are part of normal street life. Our model region has one of the largest e-bike fleets in Germany and it is a grand sight to see these bikes out on the streets. Despite the harsh winter, our 500 test riders together covered more than 400,000 kilometres in just six months.

01 KOPA II – 600 E-BIKES ARE IN OPERATION ON THE STREETS OF THE STUTTGART MODEL REGION

With the release of 30 e-bikes in a total of 16 community fleets and public facilities, EnBW Energie Baden-Württemberg AG has extended its test fleet to a new user group. Approximately 600 battery-operated two-wheeled vehicles are active on the streets of the Stuttgart region and are being tested in everyday operation. The central elements of the project in the framework of the electromobility region of Stuttgart model region are the installation and operation of charging stations as well as the analysis of electric mobility behaviour. The electric moped will be prototypically developed as a »travelling laboratory« by means of data loggers.

Thus the mobility and charging behaviour can be analysed in real time during the field test. At the same time, private and public charging stations will be constructed, which can also communicate with a web portal. Aside from around 40 cargo scooters, which will especially be deployed by the city of Stuttgart, almost 600 so-called elmotos are in operation. What makes this vehicle so special is that it's a real Swabian – not only designed and developed in the region, but predominantly manufactured in the south of Germany.

Keyword

E-Roller

Recipients

EnBW AG

Project budget €

4,177,636

Subsidy amount €

2,088,818

600 BATTERY-OPERATED TWO-WHEELERS ON THE STREETS OF STUTTGART

02 KOPA II – HYBRID BUSES ARE IN OPERATION ON THE STREETS OF STUTTGART – CHALLENGING TASKS AHEAD

»For 2009 the SSB wants to participate in a follow-up project called 'vehicle with energy management'. What has already been implemented in trams will also be put in place for busses: electric operation, use of braking energy in order to save 10-15% of fuel consumption.« On the occasion of the completion of fuel cell bus project, this was the announcement five years ago in October 2005 of a follow-up project of the Stuttgarter Strassenbahn AG (SSB) (Stuttgart Tramways). The promise was fulfilled: at the end of 2009 the first hybrid bus drove on a trial basis on the number 42 bus line. On the 13th September the first three of a total of five hybrid busses (Mercedes-Benz Citaro G BlueTec Hybrid) were delivered to the SSB. SSB director Wolfgang Arnold emphasised that the deployment of hybrid busses was the urban transport

company's contribution to the electromobility model region Stuttgart project and referred to the long history of electromobility of the SSB, which has driven with electricity since 1895. »We are excited to see how the busses will stand the test of everyday operation in Stuttgart«, says Arnold. The positive response from test operation is encouraging.

The goal is clear: the hybrid busses must be able to handle the same tough everyday line service as their diesel engine operated counterparts. Their daily schedule consists of a 16-18 hour deployment time, 650 different drivers, demanding topographical challenges, around 200,000 passengers per day, over 650 stops on 56 lines and availability requirements of over 95 percent.

Keyword

HyBus

Recipients

Stuttgarter Straßenbahnen AG

Project budget €

2,685,404

Subsidy amount €

1,342,702

Keyword

EleNa

Recipients

	Project budget €	Subsidy amount €
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (FhG)	379,889	379,889
ARADDEX AG	362,946	181,473
Heldele GmbH	220,400	110,200
Institut für Brennstoffzellentechnik, Hochschule Esslingen	317,170	317,170
Huber Automotive AG	539,368	269,684
Kompetenznetzwerk Mechatronik BW e. V.	49,870	24,935
Lauer & Weiss GmbH	150,000	75,000
Forschungsinstitut für Kraftfahrwesen und Fahrzeugmotoren Stuttgart (FKFS)	132,657	132,657
Telemotive AG	145,814	72,907
WS Engineering GmbH & Co. KG	50,250	25,125
J. Eberspächer GmbH & Co. KG	50,562	25,281
TÜV SÜD Automotive GmbH	155,716	77,858

A consortium of medium-sized companies is currently starting a project called »EleNa« for the development of an electric drive retrofit kit for diesel delivery vans. A Mercedes Sprinter was chosen for this purpose. The goal of the project is the creation of a retrofit kit in the area of electric drives. Inner city and regional journeys in delivery traffic can thus be made free of emissions. At the same time, conventional drives will be available for long-distance journeys.

Above all small and medium-sized businesses will have the opportunity to gain early access to electromobility through this retrofit, with few obstacles to investment. What is exceptional about this project is on the one hand, the idea to create a solution which makes it possible to change over to electromobility

quickly and cheaply. Thus working with a short development and production cycle through non-bureaucratic collaboration makes the current plan for prototype presentation already in the first quarter of 2011 more likely.

Secondly, medium-sized companies have found each other for this project which are as equal to the task as large companies in the industry. The Kompetenznetzwerk Mechatronik BW e.V. (Mechantronics Competence Network Baden-Wuerttemberg) has created an excellent structure so that that the participating companies can not only combine their competences in the best possible way, but also avail of direct access to scientific institutions.

RAPID SWITCH TO ELECTROMOBILITY AT THE LOWEST POSSIBLE COST

Keyword

Testfeld Ludwigsburg

Recipients

	Project budget €	Subsidy amount €
Stadt Ludwigsburg	75,150	37,575
Stadtwerke Ludwigsburg-Kornwestheim GmbH	186,200	93,100
Stadtmobil Carsharing AG	110,988	55,494
Cargo-Logix GmbH	653,450	326,725
Universität Stuttgart	56,230	56,230
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (FhG)	142,486	142,486

The goal of the Ludwigsburg model project »Sustainably networked mobility« is to develop the foundation for an economic and consumer-oriented transport concept for the future and to prepare the way for and lend support to the market introduction of electric vehicles. Central elements in this process are the construction of the necessary public infrastructure, fundamental awareness-raising in the population and local companies, the investigation of user behaviour as well as pre-competitive business models. A key component is for example the question of how a city public administration can cover its mobility needs using electric vehicles. In particular it will be investigated which vehicles are suitable for which urban service journeys or routes.

In addition citizens of the city will have access to the vehicles in a synergistic rental concept, so that the 'down' times of electric vehicles will be reduced and as many different users as possible get the opportunity to test electric vehicles. The electric vehicles will be supplied with renewable electricity, as electromobility only makes sense in terms of climate targets where no or few CO2 emissions are generated. The model project »Sustainably networked mobility« is a joint project of the City of Ludwigsburg, the Stadtwerke Ludwigsburg-Kornwestheim GmbH, the University of Stuttgart and the Fraunhofer Institute IPA. The Ludwigsburg model project is a first step in the electromobile future of the city.

05 KOPA II - 50 VITO E-CELLS FOR THE STUTTGART REGION

Keyword

IKONE

Recipients

	Project budget €	Subsidy amount €
Daimler AG	9,148,212,39	3,101,244
TÜV SÜD Automotive GmbH	760,206	380,103
EnBW Energie Baden-Württemberg AG	409,882	204,941
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (FhG)	589,586	589,586

The goal of IKONE, a project under the leadership of Daimler AG, is to test 50 Mercedes-Benz battery-operated transporters under everyday conditions in the Stuttgart model region. The project will test their efficiency regarding consumption and range as well as their everyday suitability in urban delivery traffic. IKONE stands for »Integriertes Konzept für nachhaltige Mobilität« (integrated sustainable mobility concept). In addition the behaviour and needs of the users of this electric van will be investigated. It is important to prove to

customers that electric vehicles are economically viable and expected safety standards will be fulfilled. It is in the interests of efficiency to develop new business models together with customers. Furthermore the goal is also to deploy the test vehicles in as many different places as possible in the region of Stuttgart in order to reach a large target group. In this respect the complex topography of the Stuttgart region with its many gradients also represents a special challenge, as well as the heavy traffic density.

Keyword

E-Boxster

Recipients

Porsche Engineering Group GmbH

Project budget €

6,005,900

Subsidy amount €

2,882,832

The necessity of designing global energy use that is friendlier to the environment and protects our resources leads to the development of new technologies in all energy-relevant areas. With regards to private transport, increased electrification promises the chance to on the one hand, cover the ever increasing global mobility requirements, but at the same time to reduce the almost 100 percent dependency on fossil fuels.

For a sports car manufacturer, the deployment of future-oriented technologies is a considerable part of the development of new vehicles. This also includes the part-electrification or hybridisation of Porsche vehicles as well as direct petrol injection or lightweight construction concepts.

Porsche presented the Panamera S Hybrid, the second serial vehicle which followed the Cayenne S Hybrid, which can also drive purely electrically. With a total output of 380 HP, the Panamera S

Hybrid can achieve NEDC of 7.1l/100 km, whereby the CO₂ emissions only amount to 167 g/km. With optionally available rolling resistant optimised all-season tyres, this value could be further reduced – at 6.8l/100 km for 159 g/km.

With the support of the Federal Ministry of Transport, Building and Urban Development (BMVBS) under the umbrella of the Region of Stuttgart Model Region the concept of electrification is taking a step further. The build-up and the real testing of battery-electric sports cars without a combustion engine on the basis of the Porsche Boxster are the new challenges. Different aspects such as the sustainability of batteries, charging and discharge cycles, ranges, the acceptance of electric vehicles and their charging stations as well as transport safety under everyday conditions will be tested. All this tailored to the specific customer requirements for a sports car: performance, power and efficiency, rolled into a single concept.

COVERING GLOBAL MOBILITY REQUIREMENTS

Keyword

KoPa II - Electromobile City

Recipients	Project budget €	Subsidy amount €
Zweckverband Flugfeld Böblingen/Sindelfingen	233,758	93,503
Universität Stuttgart	400,808	400,808
Siedlungswerk gemeinnützige Gesellschaft für Wohnungs- und Städtebau mbH	75,940	22,782
SENSAPOLIS GmbH	71,000	28,400
LIC Langmatz GmbH	330,133	132,053
Max Holder GmbH	320,942,50	128,377
Stadtmarketing Böblingen e. V.	48,900	14,670
Wirtschaftsförderung Sindelfingen GmbH	48,540	14,562
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (FhG)	176,000	176,000
Fernwärme Transportgesellschaft mbH	167,040	50,112

Keyword

KoPa II - Pedelec Stuttgart

Recipients	Project budget €	Subsidy amount €
Landeshauptstadt Stuttgart	1,255,224	1,255,224
DB Rent GmbH	2,828,254	1,414,127

REDUCING DEPENDENCY ON FOSSIL FUELS



MODEL REGION MUNICH

HELMUT KÖLBL, HEAD OF THE PROJECT HEADQUARTERS

It is possible to hybridise vehicles in various ways. In your model region, for example, three different types of hybrid busses are in service. What insights are you hoping to gain through their deployment?

The question of which of the hybrid technologies will be able to assert themselves in the long run is still unclear. This is one reason why these vehicles are not yet being produced in large series and are therefore considerably more expensive than conventional busses. Ultimately, they need to be financed through the collection of fares. It is therefore important that their procurement also makes economic sense before large orders are made. The interim results of our first test vehicle with parallel hybrid technology in regard to fuel savings have been rather disappointing so far – yet they confirm our strategy: We wish to test various hybrid technologies and thereby support the manufacturers in their continued development of these new vehicle technologies.

A decisive factor for the success of electromobility is a simple and convenient recharging infrastructure. How important is it to obtain realistic information in regard to the use and charging performance electric vehicles? Furthermore, what are the requirements and who

are the players that must be considered for a needs-oriented charging infrastructure?

Home charging stations are the basis for the successive development of a charging infrastructure. These can be built quickly and simply to solve the problems of range and recharging times for a majority of typical transport routes. The future charging solutions for street parking vehicles, however, are not yet clear. It is anticipated that the resulting limitations will only have a marginal effect during the market introduction phase due to the low number of electric vehicles at that time. The development of a basic supplementary network of »semi-official« recharging stations makes sense to counter the concern of limited range. Furthermore, work is currently being conducted on a high-performance recharging station to enable fast charging, e.g. for intermediate charging during longer journeys. It appears that fast charging times of less than half an hour will be realistic. This needs to be weighed up, however, against the physical limitations of batteries where fast charging times can have a negative effect on service life.

01 KOPA II – OPERATIONAL TRIAL OF A HYBRID BUS WITH DIESEL ENGINE, SERIAL DRIVE AND THE COMPARISON OF THREE HYBRID CONCEPTS

Within the framework of system comparison three hybrid busses with different technical hybrid concepts and storage media will be tested in the regular operation of the MVG bus network so that environmental- as well as cost-effectiveness can be compared. The vehicles to be compared are:

- Solaris Urbino 18 hybrid bus with parallel 2-wheel-drive and nickel-metal hydride batteries.
- MAN Solo-hybrid bus with serial drive and super capacitors as storage media
- Mercedes-Benz hybrid articulated bus (Citaro) with serial 4-wheel drive and Li-Ion batteries (from 2011)

The goal is to determine the most appropriate technology for line operation in Munich. To achieve this, the compared vehicles will be tested on the basis of the following criteria:

- Increase in efficiency and profitability of the transport system
- Improvement in the acceptance of the bus system through better travel comfort, reduction in noise pollution and intermittent zero emission travel

- Increase in environmental friendliness through reduction of fine dust and nitrogen oxide emissions, as well as reduction in fuel consumption

This occurs through the acquisition of different operating data, such as the number of transported passengers, consumer data, travel speed and the number of stops and starts.

Aside from the vehicles, investment will also be made in the bus infrastructure, for example in the further prioritisation of bus traffic lights and in new bus lanes. As a result the interactions of acceleration measures on the efficiency of the hybrid in operation are to be tested.

Keyword

HyMunich

Recipients

Stadtwerke München GmbH

Project budget €

602,846

Subsidy amount €

301,423

SUITABLE TECHNOLOGY FOR LINE SERVICE

Keyword

Komm E Mob

Recipients

Stadtwerke München GmbH

Project budget €

998,904

Subsidy amount €

499,452

Within the electromobility model region of Munich, the creation of a sustainable, local electromobility concept is planned with regard to private transport in Munich. This concept will be developed by the Stadtwerke München (municipal authorities in Munich) in cooperation with the regional capital Munich. The following issues will serve as starting points:

- What framework conditions should be created and which measures taken in order to facilitate sustainable electromobility in the Munich region?
- Who are the users, target groups and customers of private electromobility in the Munich region?
- What travel services already exist and in which areas and for what transport routes would electromobility make sense?
- How can further project plans in the model region be reasonably integrated in an electromobility concept?

The goal for Munich is to show how electromobility in private transport could develop up to 2030 under changes in different framework conditions (i.e. in different scenarios), and accordingly what a charging infrastructure that meets demand must look like. In addition, a general call to action in electromobility in the Munich region will be demonstrated as well as concrete courses of action outlined.

COMMON ELECTROMOBILITY CONCEPT IN PRIVATE TRANSPORT

03 KOPA II – SURVEY OF USER PREFERENCES IN FIELD TESTS, DEVELOPMENT OF A FAST CHARGING SYSTEM, PROVISIONS FOR GRID QUALITY (DRIVE ECHARGED)

Keyword		
DC-charging		
Recipients	Project budget €	Subsidy amount €
Bayerische Motoren Werke AG	4,081,368	2,040,684
Siemens AG	2,922,042	1,461,021

The BMW Group, Siemens and the municipal authorities in Munich are examining user-oriented and technical aspects of electromobility in the private and commercial field. The goal is to develop practical and comprehensive concepts, systems and components in a holistic way. The project includes the following key points:

Examination of everyday private electromobility

- 40 MINI E users (10 from the Bavarian Red Cross) test vehicle and charging infrastructure in a 10 month field trial (Sept. 2010 – June 2011). User behaviour and preferences will be scientifically recorded and analysed.
- Build up of an infrastructure of public and private charging stations with electricity using renewable energy

Development and testing of an integrated fast charging system

- Development of an entire system including a future-oriented communications interface on the basis of new technologies and a user-friendly charging procedure for vehicle and charging infrastructure.
- Testing of the charging system on the test bench and the pre-test vehicle (BMW ActiveE, expected between April – June 2011).
- Preparation of proposals for standardisation, contribution to national and international committees.

Examination of grid quality

- Examination of effects of different charging scenarios on the electrical grid.
- Design of technical measures and recommendations to support and improve grid quality will be developed

04 FURTHER PROJECTS

Keyword		
KoPa II – eFlott		
Recipients	Project budget €	Subsidy amount €
AUDI AG	8,010,322	4,005,161
E.ON Energie AG	1,686,850	843,425
Technische Universität München	640,802	640,802

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KG, Stadtwerke Aachen AG, HOPPECKE Advanced Battery Technology GmbH, Rheinisch-Westfälische Technische Hochschule Aachen **E-AIX TWO-WHEELER** Stadtwerke Aachen AG, Hans Hess Autoteile GmbH, DB Rent GmbH, Stadt Aachen, Rheinisch-Westfälische Technische Hochschule Aachen **04 ACCOMPANYING RESEARCH FOR THE DEPLOYMENT OF HYBRID LINE SERVICE BUSES IN THE RHINE-RUHR TRANSPORT ASSOCIATION** Rheinisch-Westfälische Technische Hochschule Aachen, TÜV NORD Mobilität GmbH & Co. KG, Verkehrsverbund Rhein-Ruhr AöR **05 HYBRID REFUSE COLLECTOR** GSAK Gesellschaft für Stadtreinigung und Abfallwirtschaft, Krefeld mbH & Co. 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(FhG), Dresdner Verkehrsbetriebe AG, Leipziger Verkehrsbetriebe (LVb) GmbH **03 FLEET OPERATION WITH ELECTRIC VEHICLES AND FLEET MANAGEMENT WITH RESPECT TO ELECTROMOBILITY IN THE MODEL REGION OF SAXONY** KEMA – IEV Ingenieurunternehmen für Energieversorgung GmbH, Stadtwerke Leipzig GmbH, Hochschule für Telekommunikation Leipzig (FH), LTb Leipziger Transport und Logistik Betriebe GmbH, DREWAG – Stadtwerke Dresden GmbH, ENSO Netz GmbH, Hochschule für Technik und Wirtschaft Dresden **01 ELECTROMOBILITY FLEET TRIALS, UPS GERMANY** United Parcel Service Deutschland Inc. & Co. OHG **02 INFRA-STRUCTURE, CHARGING STATIONS AND THE »LIVING AND MOBILITY« PROJECT FOR ELECTROMOBILE PASSENGERS CARS, MOPEDS AND PEDELECS IN FIELD TRIAL** Mainova AG, ABG FRANKFURT HOLDING Wohnungsbau- und Beteiligungsgesellschaft mbH **03 GREEN MOVE – HYBRID BUSES IN DARMSTADT** HEAG mobilo GmbH, Technische Universität Darmstadt, VDL Bus & Coach Deutschland GmbH, Vossloh Kiepe GmbH **04 COMMUNAL VEHICLES WITH HYBRID DRIVE TO REDUCE EMISSIONS** ESO Offenbacher Dienstleistungsgesellschaft mbH **05 PILOT: PEDELECS – IDSTEINER LAND ON TOUR** Süwag Energie AG, Storck Bicycle GmbH **06 DEMONSTRATION OF A HYBRID RAIL VEHICLE AND PROOF OF TECHNICAL SUITABILITY FOR EVERYDAY USE** MTU Friedrichshafen GmbH, DB RegioNetz Verkehrs GmbH **07 SOH FUELLING STATIONS** Stadtwerke Offenbach Holding GmbH **BIKE + BUSINESS 2.0** Planungsverband Ballungsraum Frankfurt/Rhein-Main **IWES** Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (FhG) **EVOMOTION** Energieversorgung Offenbach AG **NEMO** Städtische Werke AG **DOOR-TO-DOOR MOBILITY IN LONG-DISTANCE** DB FuhrparkService GmbH **MOREMA** juwi R & D Research & Development GmbH & Co. KG **HYBRID COMMUNAL VEHICLE** Eigenbetrieb Abfallwirtschaft und Stadtreinigung der Stadt Darmstadt (EAD), Technische Universität Darmstadt **103 LINE** Offenbacher Verkehrs-Betriebe GmbH, Rhein-Main-Verkehrsverbund GmbH (RMV), Engel Elektromobile GmbH i. G. **SOCIAL RESEARCH** Fachhochschule Frankfurt am Main – University of Applied Sciences, Johann Wolfgang Goethe-Universität Frankfurt am Main, e-hoch-3 GbR **EXPERIENCING THE FUTURE** Verein für Ökologie, Gesundheit und Bildung e.V. **PRODUCT ACCEPTANCE** Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (FhG), ALL4IP TECHNOLOGIES GmbH & Co. KG **01 E-ROLLER** EnBW Energie Baden-Württemberg AG **02 HYBUS** Stuttgarter Straßenbahnen AG **03 ELENA ELECTRIC DRIVE RETROFIT KITS** Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (FhG), ARADEX AG, Heldele GmbH, Institut für Brennstoffzellentechnik/Hochschule Esslingen, Huber Automotive AG, Kompetenznetzwerk Mechatronik BW e.V., Lauer & Weiss GmbH, Forschungsinstitut für Kraftfahrwesen und Fahrzeugmotoren Stuttgart (FKFS), Telemotive AG, WS Engineering GmbH & Co. KG, J. Eberspächer GmbH & Co. KG, TÜV SÜD Automotive GmbH **04 SUSTAINABLY NETWORKED ELECTROMOBILITY** Stadt Ludwigsburg, Stadtwerke Ludwigsburg-Kornwestheim GmbH, Stadtmobil Carsharing AG, Cargo-Logix GmbH, Universität Stuttgart, Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (FhG) **05 50 VITOSE-CELLS FOR THE STUTTGART REGION** Daimler AG, TÜV SÜD Automotive GmbH, EnBW Energie Baden-Württemberg AG, Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (FhG) **06 E-BOXSTER** Porsche Engineering Group GmbH **07 ELECTROMOBILE CITY** Zweckverband Flugfeld Böblingen/Sindelfingen, Universität Stuttgart, Siedlungswerk gemeinnützige Gesellschaft für Wohnungs- und Städtebau mbH, SENSAPOLIS GmbH, LIC Langmatz GmbH, Max Holder GmbH, Stadtmarketing Böblingen e.V., Wirtschaftsförderung Sindelfingen GmbH