

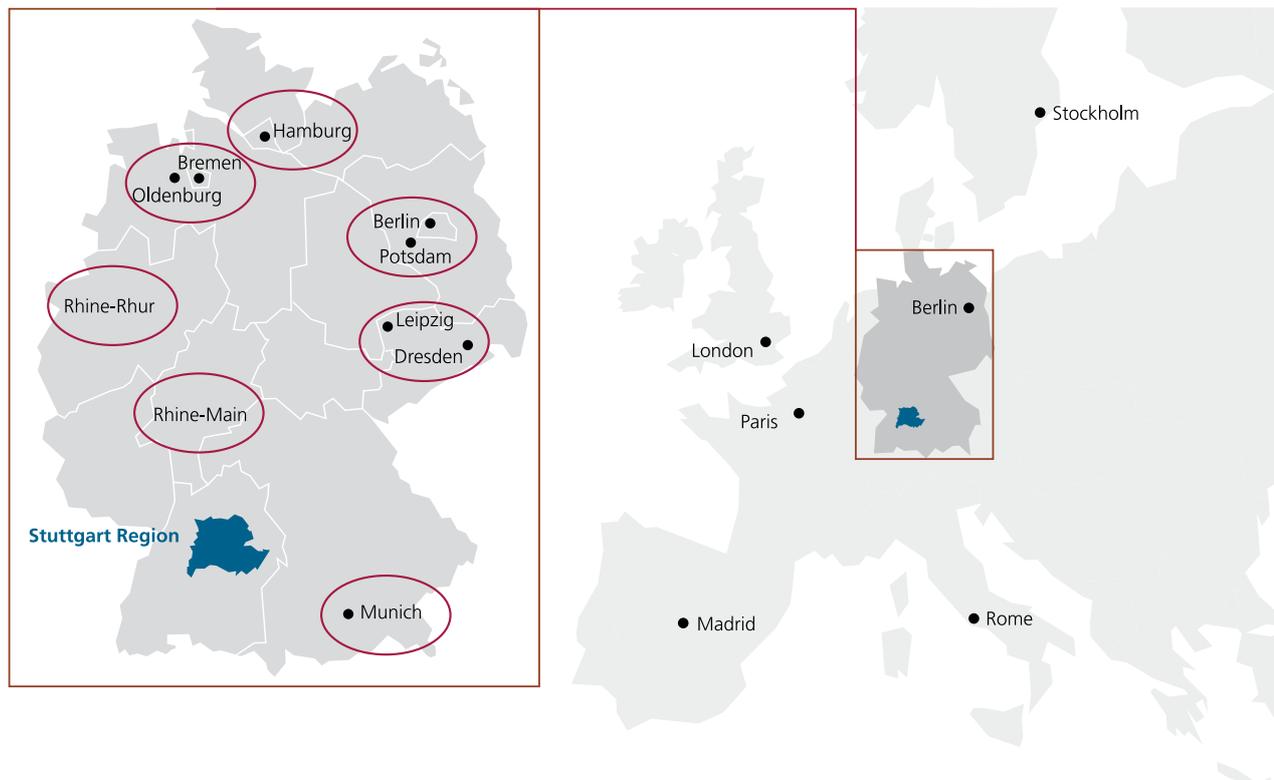


The Stuttgart Electric Mobility Pilot Region



Wirtschaftsförderung
Region Stuttgart

Turning the Stuttgart Region into an e-mobility laboratory



Regional e-mobility initiative stakeholders

- Local government agencies and local public transport operators
- Daimler, Porsche, EnBW, Bosch, Voith
- Component manufacturers and businesses across Baden-Württemberg
- Fraunhofer Institutes (IAO, IPA, IBP), DLR and ZSW
- University of Stuttgart and Research Institute of Automotive Engineering and Vehicle Engineering (FKFS)
- Karlsruhe Institute of Technology (KIT)
- Esslingen University of Applied Sciences.
- Chambers of commerce
- Stuttgart Region Economic Development Corporation

A major regional e-mobility initiative, the Modellregion Elektromobilität, will raise the public profile of electric drive transportation, explore electric drive technologies and ultimately, accelerate the launch of electric vehicles on the mass market. Well over 1,000 electric vehicles – pedelecs (electric bicycles), electric scooters, automobiles, vans and buses – will be on the Stuttgart Region's roads in summer 2011. Hundreds of charging stations will be installed in public and semi-public places (such as car parks), paving the way towards the rollout of infrastructure that will be required in future.

Not just the birthplace of the car, the Stuttgart Region is the most significant automotive industry cluster in Europe. The industry accounts for around 180,000 of the region's one million jobs, and employs over 30 per cent of local manufacturing workers. In 2008, the automotive industry's sales amounted to more than 43 billion Euros, with exports accounting for around 70 per cent. As a result, the changing nature of transportation will have a significant impact. Rising to the challenge, carmakers and automotive component manufacturers are joining forces to reinvent the motor vehicle.

The Lohner Porsche – ahead of its time

In his capacity as chief designer for the coach-builder Jakob Lohner in Vienna, Ferdinand Porsche developed the one of the first electric drive vehicles. Making its debut at the Paris Exhibition of 1900, the Lohner Porsche received widespread acclaim.

The vehicle's front wheels were powered by electric hub motors, which achieved a remarkable energy efficiency of 83 per cent, without friction losses.

This visionary invention was revived for the space age: NASA borrowed the idea of the electric hub motor to propel its lunar rover.



Lohner Porsche, Dr. Ing.h.c. F. Porsche AG



Apollo 17-Mission on Decembre 11, 1972, NASA

Regional e-mobility hotspots

Between 2009 and 2011, the German Federal Government is providing 500 million Euros from its Economic Stimulus Package II to promote the development and commercialisation of electric vehicles. As part of this, the German Federal Ministry of Transport, Building and Urban Development (BMVBS), is contributing a total of 115 million Euros to eight regional initiatives "Electric Mobility in Pilot Regions". Stakeholders from research, industry and local government are collaborating closely, seeking to develop the necessary infrastructure and raise public awareness and acceptance of electric drive transportation (Source: BMVBS).

The Stuttgart Region is one of the eight designated regions. The stakeholders' task is to bring a co-ordinated approach to key questions surrounding the design and commercialisation of electric drive technology in Germany. Ultimately, the aim is to contribute to the Federal Government's goal of having a million electric vehicles on Germany's roads by 2020, within the scope of eco-friendly transportation schemes.

www.now-gmbh.de

Activities in the regional e-mobility initiative

- Provision and trialling of electric vehicles
- Construction and roll-out of charging stations in public places
- Development of integrated urban and regional transportation plans
- Involvement of urban and regional planning, other local government agencies, infrastructure operators, OEMs, users, trades and service providers in integrated transportation schemes
- Development of a roadmap for the electric vehicle era
- Foundation of a competence centre for electromobility



Vito E-CELL, Daimler AG



ELMOTO, EnBW AG

Driving electric vehicles forward Demonstration and pilot projects in the Stuttgart Region

Delivering the goods: IKONE – 50 Vito E-CELL vans for the Stuttgart Region

IKONE, a project led by Daimler, will trial 50 battery-driven Mercedes-Benz vans in the Stuttgart region. The aim is to assess the vans' efficiency in terms of consumption and range, and test their suitability for delivery runs in urban environments. In addition, the project will investigate the behaviour and needs of the van's users.

The key is to prove that electric vehicles are commercially viable and meet the usual safety standards: working with customers to develop new business models makes good commercial sense. Another objective is to deploy the test vehicles as widely as possible across the greater Stuttgart Region, reaching a wider public. Given that Stuttgart is at the centre of many steep hills, and is known for its high traffic density, this poses a particular challenge.

Power to the people: EnBW puts 500 electric scooters on the streets

With funds from the German Federal Ministry of Transport, energy utility EnBW is putting 500 electric scooters on the streets of the Stuttgart Region. According to the BEM, a nation-wide association to promote the electrification of transportation, the electric fleet is the largest in Germany. 3,000 people from the region applied to participate in the project. From July 2010, the 500 selected scooter testers will report for one year on their experiences with driving and charging the vehicles. Equipped with GPS devices, the e-scooters are "labs on wheels". EnBW is donating further e-scooters to local government organisations. For example, Stuttgart city is already testing 25 electric scooters.

EnBW's long-term vision is to incorporate electric vehicles into the "smart home" concept, as an efficient way to store and use energy. To this end, EnBW is working with project partner Bosch in a parallel project, MeRegioMobil, to develop intelligent charging stations. For the duration of the project, the 500 scooter testers will be able to recharge their vehicles for free. And in a further demonstration of the region's prowess, the majority of vehicles used in the project are Elmos, which are largely manufactured locally.

Speeding into the future: the Porsche electric sports car

For sports car makers, cutting-edge technology is a major part of the development of every new vehicle. Porsche Intelligent Performance is the result of 60 years of sports car design. The 918 Spyder concept vehicle demonstrates that a high-performance sports car can be powered by highly efficient, low-emission technology. The concept vehicle is a unique combination of high-tech racing car and plug-in hybrid drive.

Under the regional e-mobility initiative, the idea is being taken a step further. The new challenge is to construct electric sports cars on the basis of the Porsche Boxster, and test them in real-life conditions. The tests will cover the battery life, charging and discharging, range, acceptance of the vehicles and charging stations, and safety in regular traffic. All this will be measured in line with the demanding standards of sports car customers. Performance and efficiency – in one.

Citaro G BlueTec Hybrid

The Citaro G BlueTec Hybrid is an 18-metre long articulated bus built by Mercedes-Benz. This high-tech “bendy bus” features quiet, smooth, and often completely emission-free driving, a unique design with four electric wheel hub motors and the world’s largest lithium-ion vehicle battery. This battery stores energy from the diesel generator and electric energy recovered during braking. As a result, the already low diesel consumption is reduced by up to 30 per cent – as are green house gas emissions.



Citaro diesel-hybrid bus, SSB

Stuttgart wheels out five diesel-hybrid buses

From August 2010, SSB, Stuttgart’s public transport operator, will gradually introduce five Citaro diesel-hybrid buses into its regular service. The SSB will deploy the vehicles on a variety of routes – including the challenging route 42, which climbs into the city’s hills. While the buses are in service, TÜV Nord will measure their energy consumption and emissions. PE International will conduct an environmental life-cycle assessment and estimate total costs of ownership. This includes comparing conventional diesel buses and hybrid buses across their entire lifecycle, evaluating the impact on the SSB fleet. In addition, the project will allow the general public to experience electric vehicles first-hand. In view of the increasing move towards electric drive technology, the SSB will gain useful knowledge about necessary modifications to maintenance equipment, and give maintenance staff, drivers and emergency services personnel valuable hands-on experience.

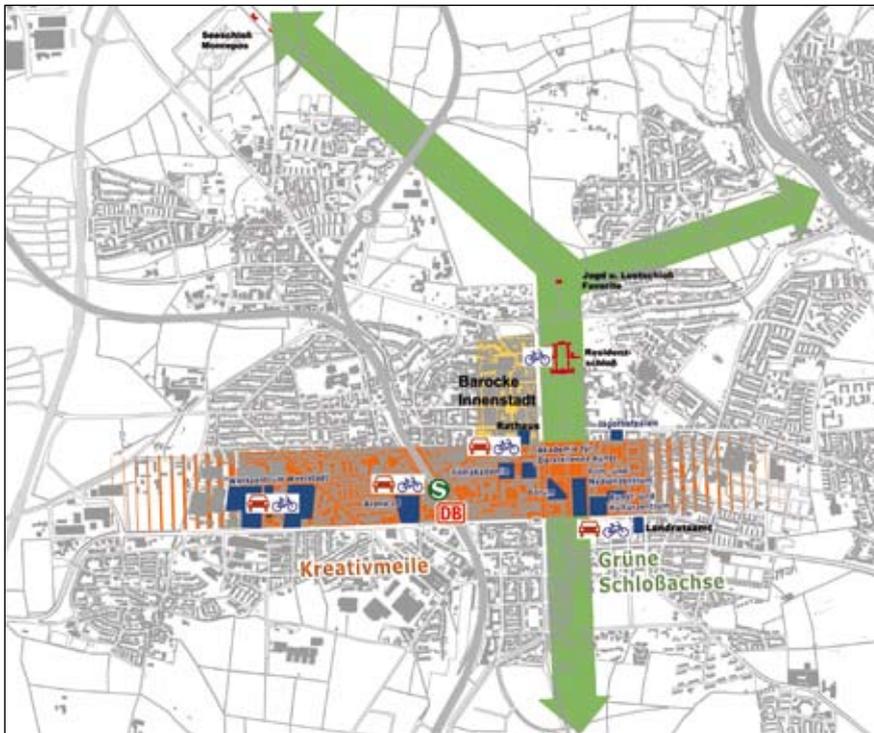
Making the switch: ELENA – Electric drive retrofits for diesel vans and small trucks

A group of mid-size companies is developing electric drive retrofits for vans and small trucks with conventional combustion engines, of the type often used by small and medium-size enterprises (SMEs). The retrofits enable a quick transition to the new electric drive technology with minimal upfront investment – independently of vehicle manufacturers’ middle-to-long term plans. But these mid-size component manu-

facturers will also be key for OEMs as they develop the next generation of electric vehicles. Retrofitting takes place in auto repair shops, offering early practical experience with the new technology and safety measures associated with it.

The ELENA partners and their tasks

| | | |
|---|--|--|
| Aradex AG | Electric drivetrain, design of the motor | www.aradex.de |
| Fraunhofer IPA | Production plan, follow-up activities, business plan, project management | www.ipa.fhg.de |
| Research Institute of Automotive Engineering and Vehicle Engines Stuttgart (FKFS) | Driving simulation | www.fkfs.de |
| Heldele GmbH | Charging stations | www.heldele.de |
| Huber Automotive AG | Vehicle control units | www.huber-group.com |
| IBZ, Esslingen University of Applied Sciences | Systems architecture, specifications, test plan, integration | www.hs-esslingen.de |
| Kompetenznetzwerk Mechatronik BW e.V. | Communications and public relations | www.mechatronik-ev.de |
| Lauer & Weiss GmbH | Mechanical engineering of entire system, battery cooling and electric drivetrain | www.lauer-weiss.de |
| Mahle GmbH | (associated partner) | www.mahle.com |
| Telemotive AG | Communications interfaces | www.telemotive.de |
| TÜV SÜD Automotive GmbH | Safety concept | www.tuev-sued.de |
| WS Engineering GmbH & Co. KG | Auto repair shop equipment and training | www.wsengineering.de |



Electric vehicles will be available across the city, Stadt Ludwigsburg



Making electric vehicles part of the urban landscape

Until now, the focus has been on developing industrial skills and resources in electric drive technologies (batteries, power electronics, vehicle design). Local governments, urban planners and architects, however, will be confronted by change as much as the automotive sector.

Electric vehicles will require a new approach to urban planning. But electric vehicles offer a new means to advance many existing objectives of sustainable urban planning and development. A variety of projects under the regional e-mobility initiative are exploring this potential.

Ludwigsburg gets going with electric vehicles

In Ludwigsburg, residents, visitors, employees and businesses will be able to get where they need to go with electric vehicles, thanks to an innovative rental scheme. Under a publicly-funded initiative, up to five electric cars and up to 30 electric bicycles (pedelecs) will be up for hire – and cargo bikes and electric scooters may be added to the offering. Rental stations will be located throughout the city. The local utility, SWLB, will power the vehicles with renewable electricity generated from biomass: electric vehicles offer the greatest environmental benefits when they are powered by carbon-neutral or low-carbon electricity.

The array of electric vehicles on offer will be a noticeable presence in local traffic, presenting an alternative, emission-free form of transport. The accompanying research project will investigate user preferences, to align the vehicles' future development with consumers' needs. Ludwigsburg is proactively participating in efforts to promote electric drive and hydrogen technology, and roll out the infrastructure to support it.



Tomorrow's urban landscape, Zweckverband Flugfeld Böblingen/Sindelfingen



Call a Bike, Landeshauptstadt Stuttgart

Electric vehicles shaping the streets of tomorrow

The 80-hectare large Flugfeld area lies directly on the national motorway A 81 between Stuttgart and Singen. The neighbouring towns of Böblingen and Sindelfingen are planning to develop the area with a mix of business and residential buildings, including plenty of green spaces. Eventually, the Flugfeld area will accommodate 7,000 jobs and 1,600 homes. The new development will set an example of how to integrate electric vehicles into the urban landscape.

A variety of electric vehicles form a key part of the plan – including a mini-bus, cars that will be used as shuttles, and vehicles used by local government agencies. 20 charging stations, a variety of parking options and a business and pricing model for local utilities will all offer an opportunity to test future demands on urban infrastructure. In this setting, the interrelationship between various modes of transport, such as trains, buses or taxis, will play a substantial role.

To ensure that electric vehicles are used in accordance with public safety, an appropriate legal framework will be developed. The setting between the existing districts in the two towns and the newly-developed Flugfeld area enables local government to plan for the future needs of citizens.

Call a Bike – making Stuttgart a bike city

Bicycle rental schemes can be found in many major cities, Stuttgart among them. Now the city, Baden-Württemberg's capital, wants to become an international pilot city for the use of electric bicycles, known as pedelecs (from the words "pedal electric cycle"). Stuttgart's new pedelec scheme will be integrated into the existing rental programme, which offers conventional bikes, as well as the city's public transport. The 450 pedelecs should encourage residents to make more use of bicycles and public transport, despite the city's many steep hills. DB Rent is a key partner: its responsibilities include developing pedelecs suitable for rental.

Further activities and projects

MeRegioMobil

Connecting electric vehicles to the grid as mobile energy storage units – that's the vision of MeRegioMobil, a project led and implemented by EnBW. MeRegioMobil is part of the IKT for Electromobility programme, funded by the German Federal Ministry for Economics and Technology (BMWi). MeRegioMobil's goal, in conjunction with the Stuttgart Electric Mobility Pilot Region, is to develop and roll out infrastructure in Karlsruhe and Stuttgart in 2010 which will be capable of supporting a large number of electric vehicles. Culminating in late 2011, a region-wide field test will trial the technology. Besides the installation of intelligent charging stations, the initiative will explore the use of batteries for dynamic energy storage. In addition, it encompasses the development of new business models and incentive systems and the design of cutting-edge location-based telematics services.

<http://meregionobil.forschung.kit.edu>

Robert Bosch Zentrum für Leistungselektronik

The Bosch Group, the University of Applied Sciences Reutlingen, the University of Stuttgart and the government of Baden-Württemberg are founding a study and research centre for power electronics. The collaborative venture has brought about the first research and teaching facility of its kind in Germany. Power electronics includes components and systems, such as those in hybrid and electric vehicles, but also in areas such as renewable energy for photovoltaic systems. The Robert Bosch Centre for Power Electronics is located at Reutlingen and Stuttgart.

www.rbzentrum.de

Batteries and fuel cells to power the future

Experts predict that, in future, a variety of drive technologies and diverse sources of power will co-exist. The fuel cell is one of those technologies. At the f-cell exhibition and conference, which takes place annually in Stuttgart, the agenda covers the latest developments, new market opportunities and potential uses for fuel cells. More than 500 people from over 20 countries have attended the conference each year since 2001 to exchange their experiences.

www.f-cell.de

Weiterbildungszentrum Brennstoffzelle Ulm e.V. (WBZU)

WBZU, which offers skills development courses, focuses on fuel cells, hydrogen, compact cogeneration plants, and since 2009, batteries. Its mission is to provide practical support for the introduction of new energy technologies and provide training and education for all manner of professions. Schoolchildren, students and interested members of the general public are regular visitors at the WBZU, taking the chance to experience the new technology first-hand.

www.wbzu.de



Mercedes-Benz B-Class F-CELL, Daimler AG

Hydrogen straight from the pump

The Baden-Württemberg region's first public fuelling station for hydrogen vehicles is situated right next to Stuttgart Airport and Stuttgart Messe (trade fair centre), on one of Germany's most important motorways. The station's costs are being met by the energy utility OMV, the gas company Linde and the carmaker Daimler. Thanks to a new compression method, fuel cell vehicles in Stuttgart can fill up with pressurised

hydrogen in just a few minutes, the same time it takes to fill a conventional petrol tank. When it burns, hydrogen emits pure water, free from pollutants that threaten the climate, such as carbon dioxide.

Further hydrogen fuelling stations are planned for Stuttgart, as well as Karlsruhe, Mannheim and other locations in Baden-Württemberg.

www.zukunftsennergien.region-stuttgart.de



smart fortwo electric drive, Daimler AG



F110 electric, Schopf Maschinenbau GmbH

A boost for the Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW) in Ulm

The ZSW conducts research into a wide range of cutting-edge transportation technologies – from renewable fuels to energy storage methods to system and mobility analyses. One of ZSW's key aims is to improve components for batteries and fuel cells. The ZSW also has a test centre for the development and evaluation of battery technologies and fuel cells. Recently, the federal and regional governments have provided significant funding for research into lithium-ion vehicle batteries. This will enable the ZSW to build on its long-standing expertise in this space.

www.zsw-bw.de

e-drive project (KIT)

With support from the Baden-Württemberg Ministry of Science, Research and the Arts (MWK), Daimler and KIT (the Karlsruhe Institute of Technology) have established the e-drive project, entailing research into more powerful battery systems, improved electric motors and power electronics. In addition to funding for research projects, Daimler will support a professorial chair for hybrid electric vehicles.

www.projekthaus-e-drive.kit.edu

Electric tow tractors preparing for take off

Tow tractors made by Schopf can be found at almost all the world's major airports, moving aircraft into position. The company is the global market leader. Recently, it has set the trend for electric tow tractors, a rapidly growing market. A number of European airports have already shown considerable interest, in light of increasingly stringent environmental protection requirements. The prototype for the world's largest electric tow tractors was extensively tested at Stuttgart Airport, with positive results. The battery installed in the prototype lasted for two shifts at Stuttgart Airport without requiring recharging.

www.schopf-gse.de

KITe hyLITE innovation cluster

The KITe hyLITE innovation cluster at the Fraunhofer ICT in Pfinztal, comprising over thirty research and industry partners, will research new technologies for hybrid lightweight construction. The aim is to develop lightweight structures from composite materials, integrating them with robust metals. By minimising energy consumption, this will help cut vehicles' carbon emissions.

The project will focus on the development of methods, materials and above all, industrial-scale production processes. Project partners include the three OEMs based in Baden-Württemberg, Daimler, Audi und Porsche, as well as component manufacturers and numerous innovative small and mid-size mechanical engineering companies.

www.fahrzeugleichtbau.de

Stuttgart Electric Mobility Pilot Region partners

The Stuttgart Region Economic Development Corporation (WRS) is co-ordinating the regional project, and acts as the central contact for the regional e-mobility initiative. With its partners, WRS is seeking to prepare the Stuttgart Region for the new era of electric vehicles, and strengthen the position of industry and commerce in this exciting new market.

The project partners include global players, mid-size companies and start-ups. A number of organisations, universities, and research institutions are supporting the programme, as are local government agencies. While the following lists are current at the date of publication, they are continually being updated.



Porsche 918 Spyder Plug-In-Hybrid, Dr. Ing.h.c. F. Porsche AG

Companies

ads-tec GmbH
www.ads-tec.de

AE Autostrom-Engineering UG
www.autostrom-engineering.de

Alfred Hermann Blechtechnik GmbH & Co.
www.blechtechnik.de

AMK Automotive GmbH & Co.KG
www.amk-antriebe.de

Aradex AG
www.aradex.de

ate antriebstechnik und entwicklungs gmbh
www.ate-system.de

BVB Consult GmbH
www.bvb-consult.de

Daimler AG
www.daimler.com

DEKRA Automobil GmbH
www.dekra.com

Dietz-automotive GmbH & Co. KG
www.dietz-automotive.de

Dornier Consulting GmbH
www.dornier-consulting.com

Dr. Ing.h.c. F. Porsche AG
www.porsche.de

J. Eberspächer GmbH & Co. KG
www.eberspaecher.com

EnBW Energie Baden-Württemberg AG
www.enbw.com

ERNI Electronics GmbH
www.erni.com

Fichtner Bauconsulting GmbH
www.fibaucon.de

FINE Mobile GmbH
www.twike.com

Gehring Wolff & Partner
www.gw-partner.de

GETRAG Getriebe- und Zahnradfabrik
www.getrag.de

Heldele GmbH
www.heldele.de

Huber Automotive AG
www.huber-group.com

ID Bike GmbH
www.elmoto.com

Industrial PDD GmbH & Co. KG
www.i-pdd.com

Lauer & Weiss GmbH
www.lauer-weiss.de

Lic Langmatz GmbH
www.lic-langmatz.de

MAHLE International GmbH
www.mahle.com

Max Holder GmbH
www.max-holder.com

PE INTERNATIONAL GmbH
www.pe-international.com

Robert Bosch GmbH
www.bosch.com

SAP AG
www.sap.com

Schopf Maschinenbau GmbH
www.schopf-gse.com

Sebastian Wider – Engineering Services
www.sw-engineering-services.com

Research and Development

- Hochschule Esslingen – University of Applied Sciences, University of Stuttgart
- Karlsruhe Institute of Technologie (KIT)
- Fraunhofer Institute for Manufacturing Engineering and Automation (IPA)
- Fraunhofer Institute for Industrial Engineering (IAO)
- Fraunhofer Institute for Building Physics (IBP)
- German Aerospace Centre (DLR) (Institute of Vehicle Concepts)
- Research Institute of Automotive Engineering and Vehicle Engineering (FKFS)
- Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW)
- EENOVA – Innovationsallianz Automobilelektronik

Local government

Numerous local government agencies, including

- The regional capital, Stuttgart
 - Böblingen
 - Esslingen
 - Fellbach
 - Göppingen
 - Ludwigsburg
 - Ostfildern
 - Sindelfingen
 - Weinstadt
- And many others



Lightweight rim made of fiber reinforced plastic, Fraunhofer Institute for Chemical Technology (ICT)

Sensapolis GmbH
www.sensapolis.de

Siedlungswerk GmbH
www.siedlungswerk.de

Siemens AG Mobility Division
www.siemens.com

Stadtmobil Carsharing AG
www.stadtmobil.de

Stuttgarter Strassenbahnen AG
www.ssb-ag.de

Telemotive AG
www.telemotive.de

T-Systems International GmbH
www.t-systems.de

TÜV Süd AG
www.tuev-sued.de

WBT Datensysteme GmbH
www.wbtgmbh.de

WS Engineering GmbH & Co KG
www.wsengineering.de

Organisations

Elektro-Technologiezentrum Stuttgart (etz)
www.etz-stuttgart.de

e-mobil BW GmbH
www.e-mobilbw.de

ExtraEnergy e.V.
www.extraenergy.org

Fachverband Elektro- und
Informationstechnik Baden-Württemberg
www.fv-eit-bw.de

Handwerkskammer Region Stuttgart
www.hwk-stuttgart.de

IHK Region Stuttgart
www.stuttgart.ihk.de

Kompetenznetzwerk Mechatronik BW e.V.
www.mechatronik-ev.de

Verband Region Stuttgart
www.region-stuttgart.org

Zweckverband Flugfeld Böblingen/
Sindelfingen
www.flugfeld.info



Modellregionen
Elektromobilität



Modellregion
Elektromobilität
Region Stuttgart



Gefördert durch



im Rahmen eines Beschlusses
des Deutschen Bundestages



**Wirtschaftsförderung
Region Stuttgart GmbH (WRS)**

(Stuttgart Region Economic
Development Corporation)
Friedrichstrasse 10
70174 Stuttgart
Germany

Managing Director
Dr. Walter Rogg

Contacts
Holger Haas
Phone +49 711-2 28 35-14

Dr. Rolf Reiner
Phone +49 711-2 28 35-824

Elke Gregori
Phone +49 711-2 28 35-58

ecars@region-stuttgart.de
Fax +49 711-2 28 35-55

www.region-stuttgart.de
www.wrs.region-stuttgart.de
www.ecars.region-stuttgart.de
www.f-cell.de