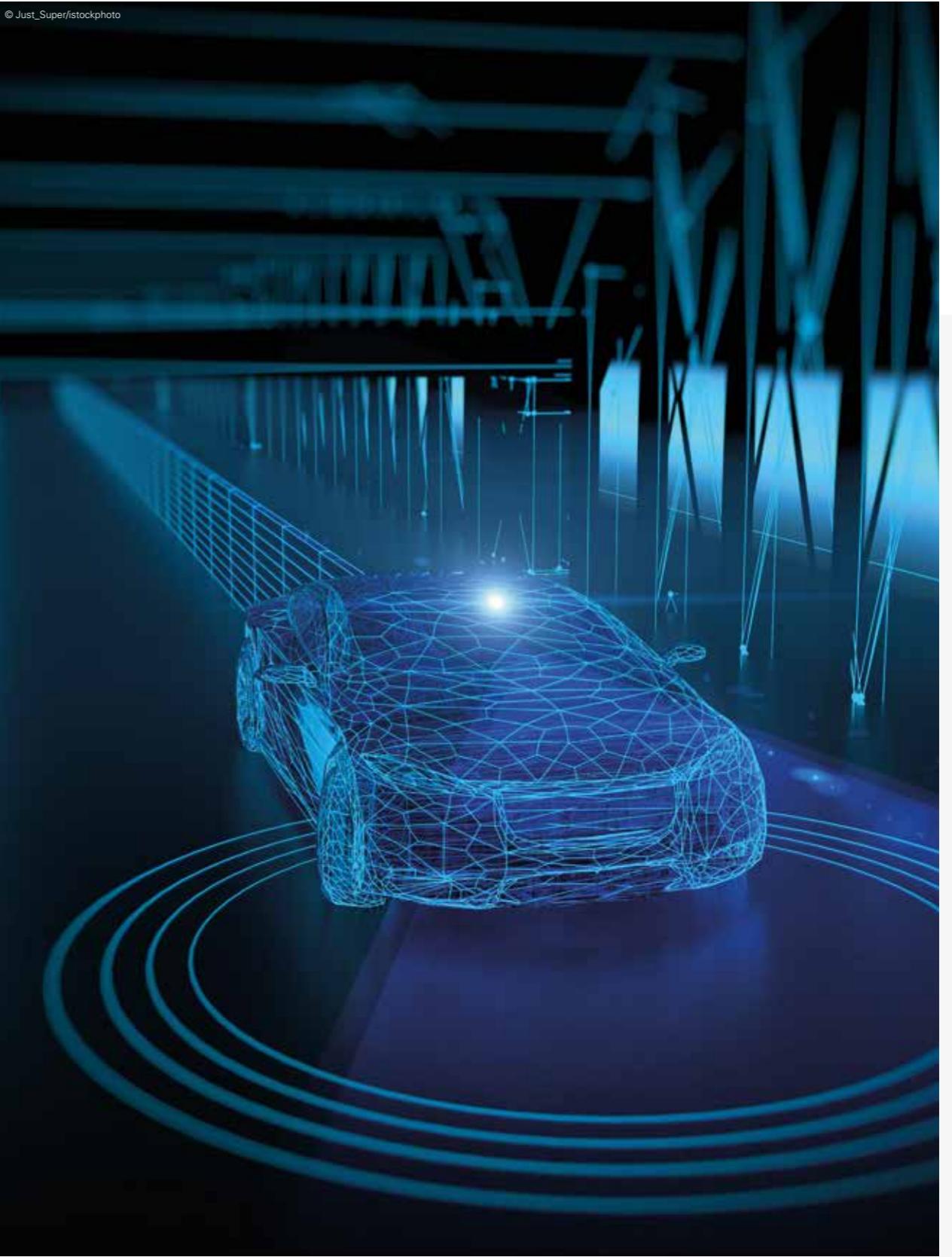
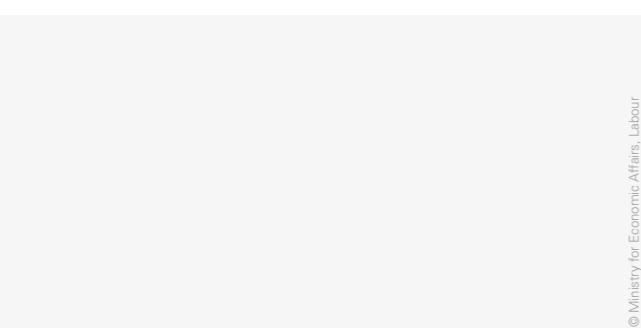


## A strong Cluster for the Mobility of the Future







**With a game-changing wave of innovation sweeping across the automotive industry, this sector needs to collaborate closely with science and politics to stay afloat. By focusing on clusters as a key instrument of its innovation policy, the State of Baden-Württemberg has provided a broad basis for us to build on.**

The Cluster Electric Mobility South-West is the major innovation alliance for sustainable and smart mobility solutions in Baden-Württemberg. For small and medium-sized enterprises (SMEs) in particular, the network offers an ideal framework to expand and develop the competences needed for future mobility solutions. As a member of cluster initiatives and nationwide networks, companies are able to corral their innovative capacity and accelerate the pace at which new technologies and business models evolve. This, in turn, provides a cornerstone for success and competitive prowess.

One of the key factors behind a successful cluster initiative is the effort that goes into securing its professional management. In the case of the Cluster Electric Mobility South-West, this investment has certainly been worthwhile. Baden-Württemberg's State Agency for Electric Mobility e-mobil BW has dedicated the last few years to the industry-wide expansion of this cooperative network, earning itself the title

'Cluster Excellence Baden-Württemberg' for its professional management.

In the years ahead, electrification and digitalisation will induce significant changes to products and processes in the automotive industry. This process of transformation involves many different facets and not only impacts manufacturers but also the automaker supply industry and the mechanical and plant engineering sectors. With the Cluster Electric Mobility South-West we have formed a strong group of active partners who are committed to resolving this challenge together.

*Nicole Hoffmeister-Kraut*

Dr Nicole Hoffmeister-Kraut MdB  
Member of the State Parliament of Baden-Württemberg  
Minister for Economic Affairs, Labour and Housing of the  
State of Baden-Württemberg



**Considered to be the cradle of the automotive industry, the city of Stuttgart is a good place to share information about future mobility solutions. As the industry meeting point for electric mobility, EVS30 – the 30th Electric Vehicle Symposium – is certainly taking place at the right location. As Stuttgart well knows, people cherish their mobility. And the car will continue to play a major role in future mobility scenarios. But expectations are high. Mobility has to become more climate-friendly and enhance livability in the world's rapidly expanding cities. Moreover, mobility has to seize the opportunities afforded by new transport concepts and technologies, such as artificial intelligence, electric drives and synthetic fuels.**

In this scenario, Germany is to bring its automaking expertise to bear and help shape the face of tomorrow's mobility. 'Smart mobility' is therefore one of the priorities of the industry-wide High-tech Strategy the Federal Government has introduced to drive forward innovation in Germany. Our policy aims at networking all the actors engaged in the innovation landscape and at fostering their growth into international heavyweights. One example is our successful Leading-edge Cluster Competition which also lists the Cluster Electric Mobility South-West amongst its 2012 prize-winners. The German Federal Ministry of Education and Re-

search (BMBF) has channelled some 40 million euros of research funding into this cluster – money well invested, since it will help Germany's south-west expand its profile and become a lead player in the electric mobility sector. More than 125 partner organisations from industry and science collaborate across industries and technologies to develop innovative mobility solutions. The cluster thus generates the kind of platform and cooperation we urgently need to secure and expand value creation and jobs in the automotive sector in the years ahead.

Transferring successful research results into marketable applications requires us to undertake an even greater innovative leap forward. As a result, the BMBF fosters all types of research and development work – most especially into improved battery and energy storage systems, microelectronics and sensors for energy-efficient and automated driving, including programmes on fuel cells and our new priority area synthetic fuels.

*Johanna Wanka*

Prof. Dr Johanna Wanka  
German Federal Ministry of Education and Research (BMBF)

A great track record

## Boosting future mobility The Cluster Electric Mobility South-West – ten years on

Four sectors. 127 partners. One cluster.

'We aim at making Germany's south-west one of the leading providers of innovative mobility solutions in the global marketplace and to advance autonomous, connected and electric mobility around the world.' This shared vision of the Cluster Electric Mobility South-West is an ongoing source of inspiration driving its members' innovative progress.

Over the past 130 years, Baden-Württemberg has gone from being the cradle of the automobile industry to one of the most important automotive ecosystems in the world. Big name automakers, including Daimler, Porsche and Audi, and leading global systems suppliers, such as Bosch, ZF or Mahle, along with a multitude of medium-sized automotive supply companies and a large number of 'hidden champions', have

all contributed to this success story. Today, the automotive industry is in the midst of the most radical transformation phase in its entire history. The technological shift towards sustainable and smart mobility solutions is challenging the conventional automotive industry's models of value creation. We need cooperation possibilities. The global player Daimler is a committed cluster member from the beginning.

**'We flip the switch on E-Mobility: At Daimler, we do have a holistic approach: Step by step, we electrify our Passenger Cars, Vans, Trucks and Buses,'** says Ola Källenius, Member of the Board of Management of Daimler AG, Group Research & Mercedes-Benz Cars Development.



Moving forward – a systematic approach to electric mobility

Founded back in 2007, the Cluster Electric Mobility South-West today boasts more than 125 partners from industry and science, making it one of the most important regional alliances for new mobility. A major milestone in its trajectory – and one that carved out its strategic and thematic profile – was its successful participation in the 2012 Leading-edge Cluster Competition organised by Germany's Federal Ministry of Education and Research (BMBF). The 2010 launch of e-mobil BW – Baden-Württemberg's Agency for Electric Mobility and Fuel Cell Technology which now manages the Cluster Electric Mobility South-West – was a vital step forward in terms of the industrialisation of electric mobility within the cluster region.

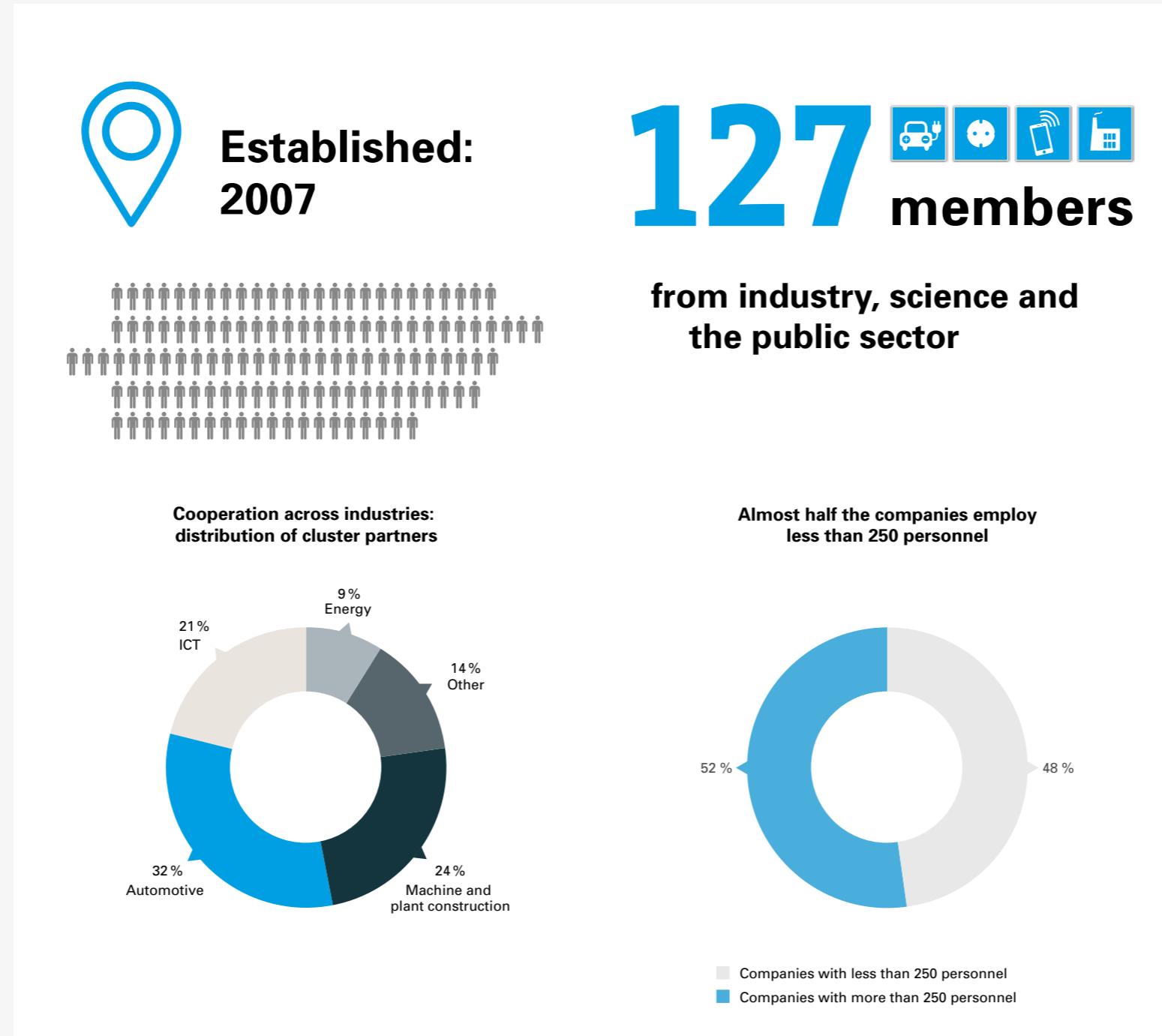
The Cluster Electric Mobility South-West offers its members a chance to think outside the confines of a given branch of industry or field of technology. Comprising four fields of innovation – Vehicle, Energy, ICT and Production – it enables major industrial players, medium-sized companies and small enterprises to work with excellent research institutes to advance their projects. Besides working on technological projects and in thematic working groups, cluster partners also engage in intensive cooperation in cross-sectoral fields, such as internationalisation, knowledge transfer, basic, advanced and specialised training and PR work.

## Ramping up the pace of innovation – together

With much shorter innovation cycles today, companies and research institutions are under considerable pressure to deliver. As a result, they are constantly increasing the volume of funding they channel into development.

**'Industry-wide intensive cooperation amongst partners from science and industry in the Cluster Electric Mobility South-West has already succeeded in bringing innovative topics such as autonomous or electric driving to the attention of the general public. Cognitive and cloud-based technologies are now the next step on the road to establishing the mobility solutions of tomorrow: safe, digital, efficient and personalised,'** says IBM boss Martina Koederitz.

Cooperation in the cluster enables members to pool their strengths, build up their know-how as a team and so leverage key synergies. As one of 15 clusters involved in BMBF's High-tech Strategy – and the only one focusing with electric mobility – the Cluster Electric Mobility South-West has successfully secured 40 million euros in funding for its partners' research efforts. And industry has also invested the same amount. However, there is more to this story than just money. One of its truly groundbreaking elements concerns the development of a joint strategy that embraces the entire system of electric mobility, mapping out steps for its realisation. The cluster succeeded in bringing this strategy to life with interdisciplinary and mutually supportive research projects which it broke down into two distinct phases of promotion. Furthermore, the State of Baden-Württemberg donated another five million euros in support of the cluster's activities – money that was needed to strengthen cluster management and to foster key measures, particularly in the cross-sectoral fields of knowledge transfer and internationalisation.



## An innovative boost: 18 beacon projects for electric mobility

One thing is for sure – every single one of these investments has been worthwhile. Having facilitated the implementation of 18 projects, leading-edge cluster promotion has given the companies in the region a major economic boost as far as the following is concerned: new charging systems, manufacturing plants and production methods for batteries and electric motors, innovative vehicle components, fleet management and charging strategies as well as ICT for smart electric vehicles. Above all, activities specifically aim to hone key new technologies and to advance ideas for innovative business models – the overall goal being to develop capabilities for new products and services and thus generate new potential for value creation in Baden-Württemberg. The cluster's working groups examine relevant topics in depth using a systematic and interdisciplinary approach, also in the fields of autonomous and connected driving or emissions-free delivery vehicles. Building on the impetus generated by its innovative fields and task forces, the cluster has already succeeding in launching additional projects on autonomous and connected driving, SME training, smart energy storage and battery recycling.

## Ready for a digital and connected future

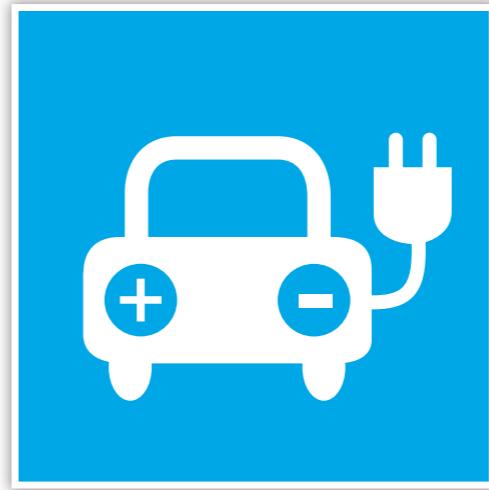
The Cluster Electric Mobility South-West will continue shaping the transition to sustainable and smart mobility in Baden-Württemberg even after support for the leading-edge cluster winds down at the close of 2017. And it aims to do so by harnessing its unique networking structure which enables its members to interact closely on the design and realisation of innovative partnerships in the interdependent fields of electrification, digitalisation and connectivity.

## Field of innovation: Vehicle

Electric power trains are reinventing the car. The ideas come from Germany's south-west.

At first sight, electric vehicles appear to be quite simple. They have none of the complicated components that are found in their conventional counterparts. But looks can be misleading – extensive tech trials are essential before an e-vehicle can hold its own against a conventional competitor. For example, an electric vehicle requires convenient charging technology and an efficient air-conditioning system to increase its range. It also needs a repair and maintenance system that lowers operating costs and a telematics package to connect up with the charging infrastructure. Moreover, some EV components, like electric steering, have been completely re-engineered. After all, for all we know, the electric delivery trucks of the future might well follow their 'driver' quietly, cleanly and autonomously at walking speed and use their 180-degree wheels to slide sideways into the tiniest of parking spaces.

More information about the Projects at [www.emobil-sw.de](http://www.emobil-sw.de)



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### ELISE –

**Stand-alone charging unit and system-integrated data gateway for electric vehicles (running time 2012–2015)**

ELISE paved the way for telematics applications and an autonomous EV charging unit. This software uses a privacy-compliant and integrated telematics interface to exchange the vehicle's measurement and diagnostic data with external interfaces. In future, real-time data hubs like ELISE will provide the connectivity gateway for autonomous electric vehicles, traffic and charging infrastructure and intermodal transportation.

### DiNA –

**EV diagnosis and repair (running time 2012–2015)**

After-sales services will change with the advent of electric vehicles. With fewer mechanical components to service, electric vehicles will require less maintenance. DiNA is a diagnostic system for the modularised maintenance of the entire power train from the high voltage battery to the inverter, engine and charging system. Reliably able to identify worn components before they fail, it helps lower operating costs.

### GaTE –

**Holistic thermal management in electric vehicles (running time 2012–2015)**

A heat pump in the tank? Not exactly, although it does explain it in a roundabout way: GaTE resolves the issue of vehicle air conditioning by combining heat and coolant pumps that distribute heat and cold with pinpoint precision. With an added de-humidifier, 'holistic thermal management in electric vehicles' results in a 60 per cent drop in heating and cooling energy demand in comparison with conventional air-conditioning systems. Test drives have recorded range increases of up to 33 per cent, which will considerably extend vehicle range in winter.

### e-volution –

**Innovative concepts for greater EV efficiency (running time 2015–2017)**

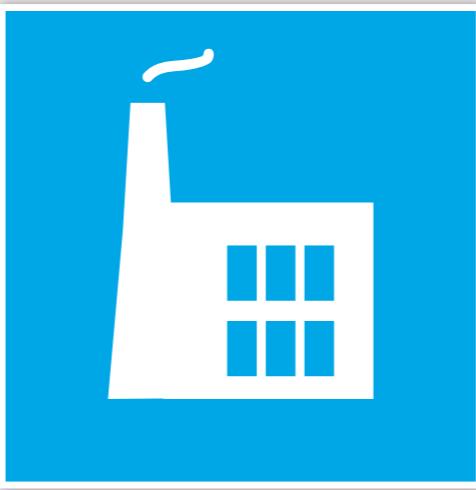
Faster, further and cheaper: e-volution brings the latest technological advances from electric vehicle research together in a new vehicle system. It takes the electrics, drive, energy and thermal management components, chassis and charging technologies to the next level and then combines them in a demonstration vehicle. Aiming for the mass production of efficient electric vehicles, e-volution seeks to innovate the way in which cutting-edge technologies are blended.

## Field of innovation: Production

Smoother acceleration thanks to more efficient production processes? Of course. Because an electric vehicle's resource consumption is at its highest when it is being made. Consequently, every innovation prior to the first kilometre on the road reduces the vehicle's ecological footprint and raises its competitive edge.

Innovation in production is doubly important: it secures economic efficiency and value creation, but it also makes for resource-friendly vehicle manufacture. And there are a great many areas that lend themselves to it. Battery production is of decisive importance, for example, but integrated e-car production in conventional vehicle assembly lines will also help lower costs by creating new mass production techniques. In this environment, all of the actors in the automotive value chain can make improvements. And the cluster can assist with matchmaking.

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acity) and the specified production targets (unit quantities and delivery deadline). In terms of experience, this project was able to harness the wealth of knowledge shared by machine and plant engineers and the automotive industry.

### **Epromo – A modular production concept for electric engines (running time 2012–2015)**

Epromo laid the foundations for the economically efficient and flexible production of electric drives. Its prime challenge centred on the many different varieties of electric drivetrains and therefore on the need for flexible and modular production processes. Modularity in manufacturing also offers a way of integrating new technologies with as little effort as possible. One approach investigated by Epromo focused on harnessing and systematically modifying experience with conventional mass-produced power trains for the production of electric drives.

### **AutoSpEM – Automated approach for the process-reliable and cost-effective manufacture of storage batteries for electric mobility (running time 2012–2015)**

It is akin to handling raw eggs: combining pouch cells to make battery modules is a major engineering challenge. Since they are not 100 per cent identical, pouch cells ('bags') require the use of sensors to quickly determine their precise shape deviations and so steer adjustments prior to assembly. AutoSpEM has therefore devised an automated process that covers all stages of the pouch cell handling process – from transport through to stacking prior to bonding.

### **ProBat – Planning quality-oriented, flexible battery systems for mass production (running time 2012–2015)**

The planning software ProBat enables automobile manufacturers and suppliers to plan and virtually test systems for the mass production of traction batteries. ProBat compiles suitable assembly processes and quality assurance systems in line with the battery's technical parameters (size and cap-

### **EFFECT360° – Energy-efficient, flexible and industrially manufactured electric power trains (running time 2014–2017)**

Innovation, production and energy efficient operation: EFFECT360° has adopted a holistic approach to the step-by-step development of an axle drive for urban electric vehicles. The electric engine, power electronics and gears should significantly undercut comparable products in terms of their volume, weight and production costs. The automated driving strategy harnesses the mutually complimentary properties of braking force recovery and gear-changing to achieve tangible gains in efficiency. This production concept finally offers the automotive industry a scalable solution for component production and final assembly.

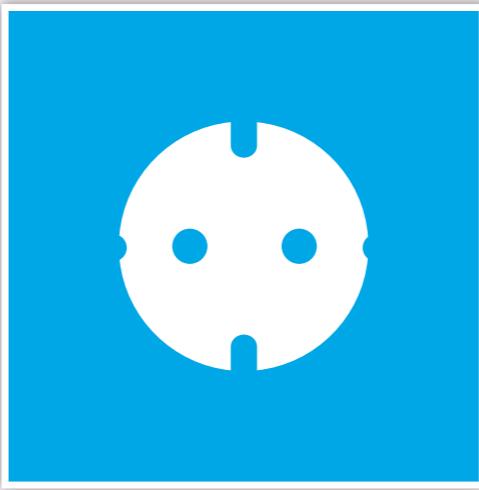
## Field of innovation: Energy

Electric vehicles and charging infrastructure are converging. Innovative charging technologies, billing systems and services are set to make recharging hassle-free.

Electric power – from regenerative decentralised sources – is the key enabler for sustainable energy supply in the future. Projects from the cluster's 'Energy' innovation field are helping to ready charging technologies for mass production – a move that will significantly enhance user comfort.



More information about the  
Projects at [www.emobil-sw.de](http://www.emobil-sw.de)



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### **BIPoLplus –**

**Contactless, inductive and position-tolerant charging  
(running time 2013–2015)**

The difference can be likened to that between a dial and a touchscreen. Inductive charging, in other words the wireless charging of traction batteries in a garage or at a set of traffic lights, has the makings of yet another iPhone moment in electric mobility. The creative force behind a number of important enabling conditions, BIPoLplus looked at the way the driver or automated drive system steers the vehicle into the correct position for charging in a bid to make the charging procedure more comfortable and convenient. It also explored the potential for optimising load distribution in the local power supply network using inductive charging stations.

### **AUTOPLES –**

**Automated parking and electric vehicle charging  
(running time 2013–2015)**

It may come as a surprise, but car parking facilities are amongst the key challenges facing automated driving. In contrast to the monotony of motorways, every car park is unique and designed to save space. Furthermore, they are also frequented by pedestrians. To add to the problem, users cannot always be sure of getting a GPS signal. AUTOPLES is thus dedicated to the technically complex procedure of parking. In future, this will involve alighting before entering the car park and leaving the driverless electric vehicle to see to parking, charging and billing all on its own – with a little help from the car parking facility and its administration. Incidentally, this project has already been conducted successfully in a car park with a narrow circular ramp.

### **InnoROBE –**

**Innovative regenerative onboard energy converter  
(running time 2012–2015)**

Airports see just as much driving as they do flying. As their name implies, range extenders can help electric vehicles in continuous operation cover longer distances or operate for longer periods of time. Integrated into an electric power train, they generate electric power and heat from (renewable) fuels. InnoROBE has developed three modular natural gas engines (methane, one to three cylinders) and one fuel cell system (20 kW, hydrogen) to increase operating time. These extenders are intended for machines used in the landscaping, construction and forestry sectors as well as in industry. By way of example, the InnoROBE fuel cell system has been used to operate an electric luggage tractor on an airport apron.

## Field of innovation: ICT

Algorithms make for better commuting – the ICT-backed coordination of public transport, electric vehicles and their charging infrastructure has the potential to revolutionise the mobility of goods and people in urban conurbations.

Sustainability, efficiency, economic viability as well as safety and flexibility are the cornerstones of modern-day electric mobility solutions. Corresponding ICT projects adopt a wide variety of approaches, ranging from the smart planning of people's daily journeys to the integration of charging into the load management schedules of connected smart microgrids along with real-time information exchanges between the smart grid and electric vehicle.

Telematics, the definition of interfaces, standards and reliable cloud applications with high data protection standards are just a few of the competences this leading-edge cluster has validated.



More information about the Projects at [www.emobil-sw.de](http://www.emobil-sw.de)



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### BiE –

**Evaluating integrated electric mobility**  
(running time 2013–2017)

Everyone knows how much effort goes into making daily travel arrangements and scheduling appointments. So how can we optimise our drive to work, to the kindergarten and to the shops? BiE is developing a mobility assistant in the form of a smartphone app that provides users with all the information they need to optimise their mobility (availability, electric vehicle range, payment modalities, connectivity options). Able to determine mobility options in complex built-up areas and megacities, this software architecture includes a forecast model for EV fleets that provides reliable information on integrated e-mobility solutions, such as electric car sharing services and their economic efficiency.

### GreenNavigation

(running time 2012–2015)

Knowledge gets you further. Keeping up to speed with the traffic situation, your driving performance and possibilities for recharging makes for optimal e-vehicle route planning, also for complex journeys. It also lowers energy consumption and facilitates the best possible adaptation and exploitation of the vehicle's range. GreenNavigation is the mastermind behind some of the key functions here: besides planning energy-optimised routes, the software gives drivers feedback on the efficiency of their driving style. It also predicts the electric vehicle's precise range in line with the driving situation. This project has crafted some of the key enabling conditions needed to devise strategies for EV driving and operations.

### eFlotte –

**EV fleet and charging management**  
(running time 2012–2015)

Operating conventional and electric vehicles as part of the same fleet is one of the challenges we face during the transition to CO<sub>2</sub>-free and non-noxious mobility. With this in mind, eFlotte has devised some new fleet and charge management solutions designed to enable the managers of passenger, goods and delivery systems to optimise EV integration into their existing fleets and thus successively replace their conventional vehicles. In mixed fleets of petrol/diesel vehicles, it is important to take account of the pros and cons of the respective propulsion system in order to facilitate economic and resource-efficient integration.

### IMEI –

**Integrated mobility and energy infrastructures**  
(running time 2014–2017)

IMEI is exploring the possibilities of harnessing EV swarm intelligence to flexibilise demand for power. Coordinating the charging schedules of a virtually connected swarm of electric vehicles using several smart microgrids can both help stabilise the grid network and generate cost benefits for fleet operators and vehicle owners. Using its software solutions that integrate electric fleets and (situational) EV swarms, IMEI not only aims to investigate technical aspects, but to examine new business models for flexible load and fleet management.

### leMM –

#### Intermodal electric mobility management

(running time 2012–2015)

Combining different modes of transport can help people get from A to B more quickly and efficiently – provided everything runs smoothly and flexibly. Building on extensive user surveys, leMM has developed concepts and software tools for the smart networking of electric and non-electric private and public transport in major urban areas. Its aim: to evaluate new e-sharing services (pedelecs and electric cars) and to establish a software architecture for real-time data exchange between fleet operators, public transport companies and leMM applications that enables planning, booking and payment in a single system.

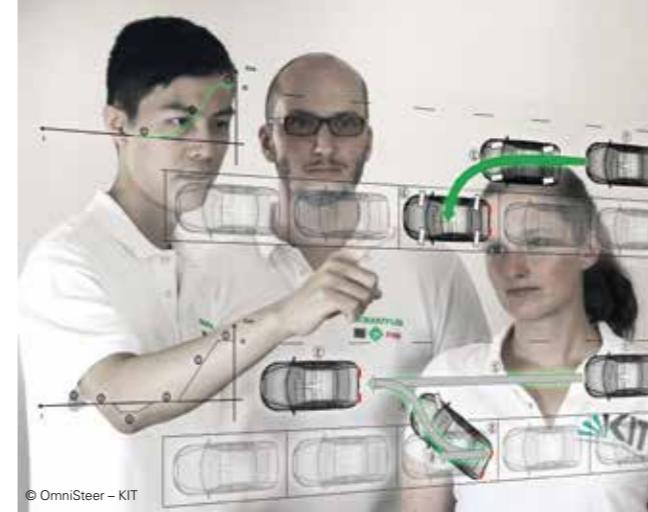
### SGI –

#### Smart Grid Integration (running time 2013–2016)

The electrification of road transport is causing the power and mobility markets to converge. The question for energy providers now is how they can meet increased demand for power as efficiently and greenly as possible. SGI has therefore mapped out corresponding concepts and strategies capable of ensuring grid stability and supply security during simultaneous electric vehicle charging. Smart integration of variable charge and discharge cycles enables a proactive decentralised response to the fluctuating feed-in of renewable energy. Amongst other things, SGI has developed an IT architecture for the real-time coordination of disconnectable and adjustable charging and discharging processes along with corresponding new tariff models.



## Further innovations outside the leading-edge cluster



The Cluster Electric Mobility South-West is a vibrant research community whose members are certainly not at a loss when it comes to new ideas for projects and development programmes seeking to resolve current challenges. But outside BMBF support for leading-edge clusters there has also been an increase in the number of innovative mobility projects, too.



### SystEM und LieSE –

#### Electric mobility supply companies

High-tech heating fabrics for innovative thermal management in the vehicle interior, deep-drawing presses for battery casings or stamps for fuel cell stacks – some SMEs remain unaware of how their product portfolio could contribute to the development of electric mobility. Building on its investigative research and focusing on opportunities and risks for small and medium-sized automotive industry suppliers, SystEM succeeded in categorising upcoming changes in e-mobility products and production processes. LieSE then transferred the results of this analysis to a consulting system for use online and at major professional gatherings to inform companies about the electric mobility production system. (running time 2014–2015/2015–2017, funded by the Ministry for Economic Affairs, Labour and Housing of the State of Baden-Württemberg)

limited by certain drawbacks, such as the significant volume of energy and raw materials required for their manufacture and the lack of high-quality recycling. The RETRO project therefore aims to develop new composite materials from recycled carbon fibres and plastics in a bid to boost resource efficiency in the field of electric mobility. (running time 2015–2017, funded by the Ministry for Economic Affairs, Labour and Housing of the State of Baden-Württemberg)

### InnoDeLiBatt –

#### Innovative production technologies for manufacturing disassemblable lithium-ion battery storage systems

One of the major challenges facing electric mobility is the development of high-quality, safe and affordable energy storage in the form of lithium-ion batteries. Radical improvements in production and connectivity technologies are the only way of resolving this issue. To lower the overall cost of electric vehicles, the InnoDeLiBatt project is dedicated specifically to energy storage systems, their assembly and disassembly and their manufacturing technologies. (running time 2016–2018, funded by the Federal Ministry for Economic Affairs and Energy; ELEKTROPOWER II)



### BiLawE –

#### Bidirectional, inductive charging systems and their economically efficient integration in the energy grid

Electric vehicles have the capacity to become virtual power storage plants on wheels – provided vehicle batteries are integrated into the smart grid of the future. Since this requires a parked electric vehicle to connect fully automatically to the power grid as often and easily as possible, BiLawE is devising

an innovative tech-cum-business model based on a wireless inductive charging system that links electric vehicles up to the power supply network in public car parks, company parking spaces or private garages. This project's contribution to the immensely important international standardisation of this new technology is yet another of its key features. (running time 2016–2018, funded by the Federal Ministry for Economic Affairs and Energy; ELEKTROPOWER II)



### XiL-BW-e –

#### Baden-Württemberg's lab network for electric mobility

Research into power trains always has to embrace the system as a whole and thus observe the way in which the individual components interact with each other and with the overarching system. The wide variety of power train solutions demands an extensive range of cost-intensive cutting-edge tools. Five project partners have now got together to harness synergies and network existing infrastructure through a new kind of research and laboratory network: XiL-BW-e. This lab configuration is especially innovative in that it provides an interface for real-time testing of spatially separated components. (funded by the Ministry for Science, Research and Art of the state of Baden-Württemberg)

### e<sup>2</sup>-Lenk –

#### Intelligent assisted steering system with optimum energy efficiency

Steering really eats away at a vehicle's range capacity. When parking or turning, for example, a vehicle's power steering system uses up to 1,000 kW. But, as the research project e<sup>2</sup>-Lenk demonstrates, electric propulsion is opening up new

possibilities such as the direct integration of power steering into the power train. Ingenious wheel-selective control of front-axle driving power can actually replace assisted steering completely, resulting in more efficient, easier and comfortable parking as well as low energy consumption – without forfeiting any of the vehicle's range. (running time 2015–2017, funded by the Federal Ministry of Education and Research)

### OmniSteer –

#### Electronic lateral and transverse guidance system for automated driving manoeuvres

Individually powered and steered, the wheels in an electric vehicle open up some completely new driving manoeuvres. OmniSteer is developing a new kind of wheel suspension system along with corresponding steering geometries and automated distance and lane assist systems that will revolutionise manoeuvrability by allowing the vehicle to switch independently between front, back and 4-wheel steering. OmniSteer has not exactly reinvented the wheel, but systems like OmniSteer's enable us to fully exploit the potential of automation in electrically powered vehicles. (running time 2015–2017, funded by the Federal Ministry of Education and Research)

### RETRO –

#### Hybrid materials from recycled carbon fibres for resource-efficient electric mobility

Thanks to their lightweight properties, carbon fibre-reinforced plastics (CFRP) have the potential to become key enablers of resource efficiency. However, full-scale CFRP exploitation is

## 'Networks are particularly important for the Mittelstand'

**Half of the member companies in the Cluster Electric Mobility South-West belong to Germany's 'Mittelstand' (small to medium-sized enterprises). That includes Bruchsal-based RA Consulting, a software developer for the automotive industry.**

**Why are you a member of the Cluster Electric Mobility South-West?**

We joined in 2011 because of 'electric mobility'. Back then this was a new topic that presented us with an opportunity to validate our developments with complex technology platforms and demonstrators. It is important for lower mid-sized businesses to engage innovatively in this kind of high-performance network that brings together players from the automotive sector's construction value chain. Cooperation is also a boon for our developers: in this leading-edge cluster, we are assigned complex tasks that challenge and motivate our staff.

**What is the next big topic on the horizon for you?**

Development cycles in the automotive industry are speeding up. Partially automated driving is the latest example. The idea was only conceived a few years ago and we are already in the trial phase. At the moment, the industry is making rapid headway in connecting vehicles with each other and their environment. I believe we will have to get used to completely new modalities and corresponding transport systems.

**What is the role of electric mobility here?**

Electric mobility is the key driving force. Vehicle connectivity is becoming increasingly important for finding somewhere to park, for charging, e-car sharing or for partially automated driving. In the leading-edge Cluster Electric Mobility South-



Armin Rupalla, CEO of RA Consulting GmbH, Bruchsal

West, we have already worked successfully with the ELISE project on these topics. Our conclusion is that there can be no electric mobility without connectivity and no automated driving without smart networks.

**Why is it so important to foster cooperation in the field of connectivity?**

Because we need to get new players on board. The leading-edge cluster took timely action and is well positioned thanks to its 'Intelligent Move' working group. Here various task forces are focusing on topics such as embedded systems, Car2Car and Car2X communication, smart grid integration and intermodality, with an eye to automated, connected and electric mobility. And ultimately it is all about being on the move. Everything has to work in moving traffic in the city, on country roads and on the motorway. Stakeholders include automobile manufacturers, logistics specialists and map providers right down to the local level. Cooperation models like Baden-Württemberg's test area for autonomous driving can only succeed if we all work together.

**Which challenges should the cluster tackle in the years ahead?**

It's important the cluster continues to offer orientation and the chance to validate new products, like in the autonomous driving test area. This means the cluster has to regularly review its activities and check whether it is really focusing on the right issues. It will also need to track emerging international trends and identify those developments that will become economically relevant. Perhaps we will soon start to think about introducing a third lane on the motorway reserved for autonomous vehicle convoys. The cluster can contribute its ideas and project activities here, too.

## Limitless innovations

**The Cluster Electric Mobility South-West is continuing its successful strategy aimed at raising the international profile of R&D projects conducted by Baden-Württemberg's medium-sized companies.**

Why should medium-sized companies want to look further afield when they have one of the world's largest markets for automotive suppliers on their doorstep? The answer is because small and medium-sized suppliers can only make electric, automated and connected driving of the future a reality in Baden-Württemberg if they cooperate internationally as part of a product value chain.

This explains why the cluster is increasingly committed to linking up local medium-sized companies with partners in Europe, Asia and North America especially. Its goal is to deliver targeted support for R&D cooperation with global partners. Joining forces with competence clusters and regional networks in other countries is intended to foster the identification of promising openings for collaboration in selected fields of technology.

An example here is AllFraTech, the German-French Alliance for Innovative Mobility Solutions. AllFraTech – which is supported by the German Federal Ministry of Education and Research (BMBF) within the scope of its support measure 'Internationalisation of Leading-edge Clusters, Forward-looking Projects and Comparable Networks' – links up the R&D efforts of Europe's two automaking and component supply regions: i.e. Auvergne-Rhône-Alpes and Baden-Württemberg. The Cluster Electric Mobility South-West and its French counterpart LUTB-RAAC are currently devising a joint approach that will allow them to launch up to three trans-frontier research and development projects with German and French SMEs starting in 2018.



Still much to be done

## Mobility, technology and structural change

Ten years down the line since the Cluster Electric Mobility South-West was founded, its mission remains as relevant as ever. Key milestones have been reached in terms of the industrialisation of electric mobility, but there is still a long way to go. In 2017, more than two million electric vehicles were in use worldwide. It is already clear that global annual EV production will be somewhere in the region of 20 million by 2020. For many of our partners, this further enhances the importance of the Cluster Electric Mobility South-West which serves as a key enabler for new research projects and for the lab-to-market development of new products and services.

**'Networked operations in the leading-edge Cluster Electric Mobility South-West are integral to our mobility strategy. Together, we are truly breaking new ground. We develop practical solutions for our customers across**

**all sectors of industry for rollout across all of Germany,'** explains Timo Sillier, Senior Vice President Sales, Product Management & Digital, at EnBW Energie Baden-Württemberg AG.

In addition to far-reaching changes to their products, companies in the automotive industry also have to accommodate the structural changes driven by smart production and Industry 4.0. The introduction of completely new production methods is set to radically alter the way the sector works, produces and behaves on the market. The technological innovations to products and production as a result of electrification and digitalisation will go hand in hand with global changes in customer behaviour and market demand. Instead of owning a vehicle, there is already a growing demand in the 'sharing economy' for 'mobility on demand' or 'mobility as a service.' This will fundamentally alter our traffic systems



and the social, cultural and economic aspects of (car-based) mobility. But even the new, regenerative energies and energy carriers and fuels – electric power, hydropower, biofuels – will require us to re-engineer our supply systems and create corresponding infrastructures.

The cluster as a key player in the transformation process

The ramifications for Baden-Württemberg's automotive ecosystem are patently clear: to harness the innovative opportunities and possibilities for growth afforded by future mobility solutions, it needs to reform traditional business models, build up technological competences in target clusters and systematically adapt strategic processes.

**'Cooperation across sectors, technologies and disciplines as part of the Cluster Electric Mobility South-West is of vital importance when it comes to enabling companies in Germany's south-west to exploit the potential inherent in this mobility transition. By working together, we are co-shaping the transition process and significantly strengthening Baden-Württemberg's position as one of the world's leading developers and producers of sustainable and smart mobility solutions,'** says Franz Loogen, the Managing Director of e-mobil BW who has headed up the Cluster Electric Mobility South-West since 2010.

With its extensive portfolio, the Cluster Electric Mobility South-West has made a name for itself as a central innovation alliance for sustainable and smart mobility solutions 'made in Baden-Württemberg'. Its increased international cooperation with leading technology networks validates its standing and outreach. Through our cooperation with our French counterpart LUTB-RAAC, we have already carved out an important niche.

In the course of its work over the last ten years, the Cluster Electric Mobility South-West has helped make a business case for electric mobility and boost its image as a catalyst for climate protection, projecting it to the top of the political agenda. In the spring of 2017 for example, Baden-Württemberg's Minister President Winfried Kretschmann launched a strategic dialogue with the automotive industry that also draws on the cluster's know-how and experience.

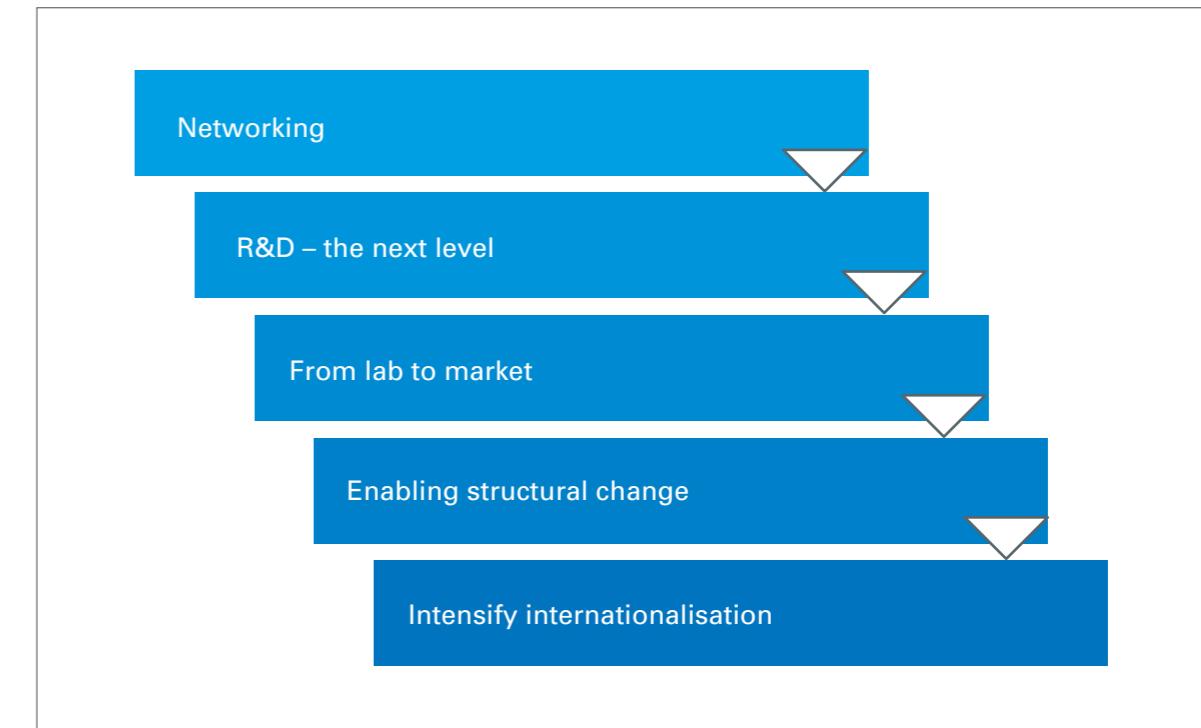
#### The Mittelstand in Germany's south-west: a success model reinvents itself

As the centre of Germany's automotive industry, Baden-Württemberg is no stranger to close interaction between car manufacturers and their efficient chain of specialised equipment suppliers and service providers, not to mention their collaboration with leading universities and research facilities. Interestingly, it is the SMEs that are setting the pace of technological progress within these networks. And we underestimate them at our peril.

Indeed, the imminent changes in technology and the resulting domino effect on innovation and value chains are set to impact supply sector SMEs first and foremost. Conventional components such as diesel injection pumps, valves, pistons, gearboxes or clutches are relinquishing their special status

and becoming obsolete. And this is where cooperation in the cluster network comes into its own. The cluster empowers SMEs to take timely advantage of the opportunities afforded by the advent of new technologies such as battery and fuel cell systems, electric power trains, power electronics and vehicle digitalisation, automation and connectivity. With an annual total of 37 billion euros earmarked for innovation, Baden-Württemberg's Mittelstand is investing heavily in its future. However, the percentage share of SME innovators, in other words companies that have re-engineered a product or process, has dropped from 42 to 22 per cent since 2002. This means that fewer and fewer SMEs are now innovating.

The Cluster Electric Mobility South-West aims to halt this trend by initiating high-profile cooperation projects. As part of the 'Mittelstandsoffensive Mobilität' – the SME mobility initiative backed Baden-Württemberg's Ministry of Economic Affairs – the cluster is steadily intensifying activities in support of small and medium-sized enterprises. Its aim: to help them gain a foothold on the new value chain for electric mobility systems. The potential is enormous. Around half of the SMEs involved in the cluster today are already technology-based enterprises. Primarily, they seek to establish contacts with other companies, sometimes from other sectors, and to find cooperation partners willing to engage in demanding and ambitious projects that will hopefully culminate in the targeted development and validation of new products. To strengthen the competitive capabilities of Baden-Württemberg's suppliers, mobility providers and infrastructure operators, the cluster is systematically widening its service portfolio to include measures and services across all new value chains of relevance to SMEs. And, taking things yet another step further, it is setting up temporary thematic working groups capable of responding flexibly to new developments. Grid integration, skilled workers and training as



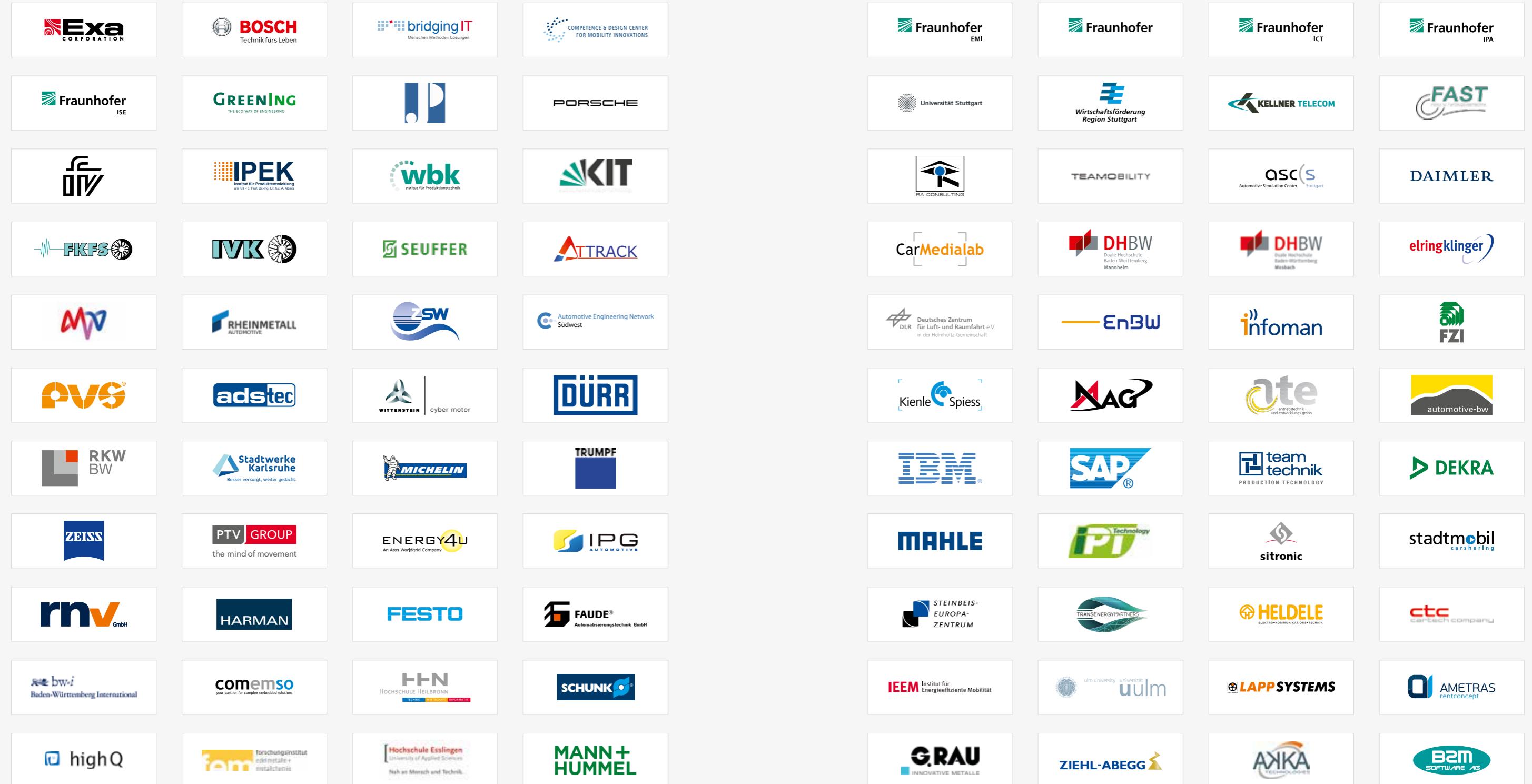
well as sales and after-sales are just some of the topics set to become more important in future for the Cluster Electric Mobility South-West.

For Baden-Württemberg, which is home to one in four jobs in the German vehicle industry, making a success of this new era of mobility is of major importance. The automotive industry is squaring up to the challenge, however. Indeed, almost half of all Baden-Württemberg's R&D expenditure goes into this sector. Investments in electric mobility and digitalisation especially have resulted in a spike in research spending – which now stands at around eight billion euros a year.

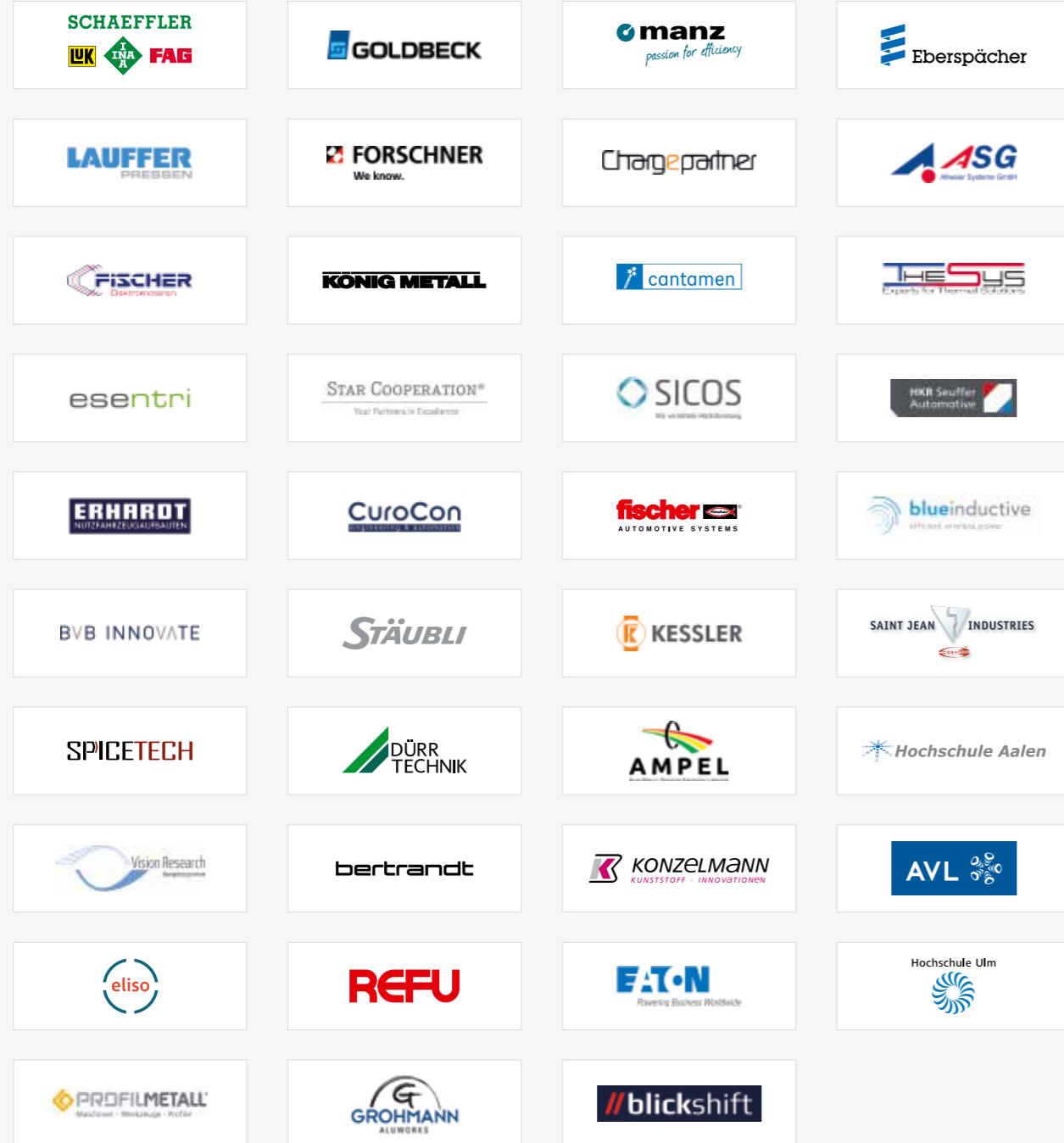
The Cluster Electric Mobility South-West will continue to support this momentum over the next decade. Together with its partners from the automotive, ICT, energy and production sectors, it aims to drive forward the industrialisation of electric mobility. Its focus is on strengthening the contacts it has forged with national and international networks and on establishing the region as a leading innovator. This applies both to the development and production of modern emissions-free vehicles and also to the design and introduction of state-of-the-art digital mobility solutions. Enabling people to see and

experience these new technologies in a wide range of applications in Baden-Württemberg constitutes an important milestone. Given the many options to choose from, structural change thus ceases to be an unavoidable fate and becomes a positive malleable future. The Cluster Electric Mobility South-West is a key enabler for electric mobility – and we aim to become enabled!

## Partners



## Partners



Status September 2017 (chronological order)

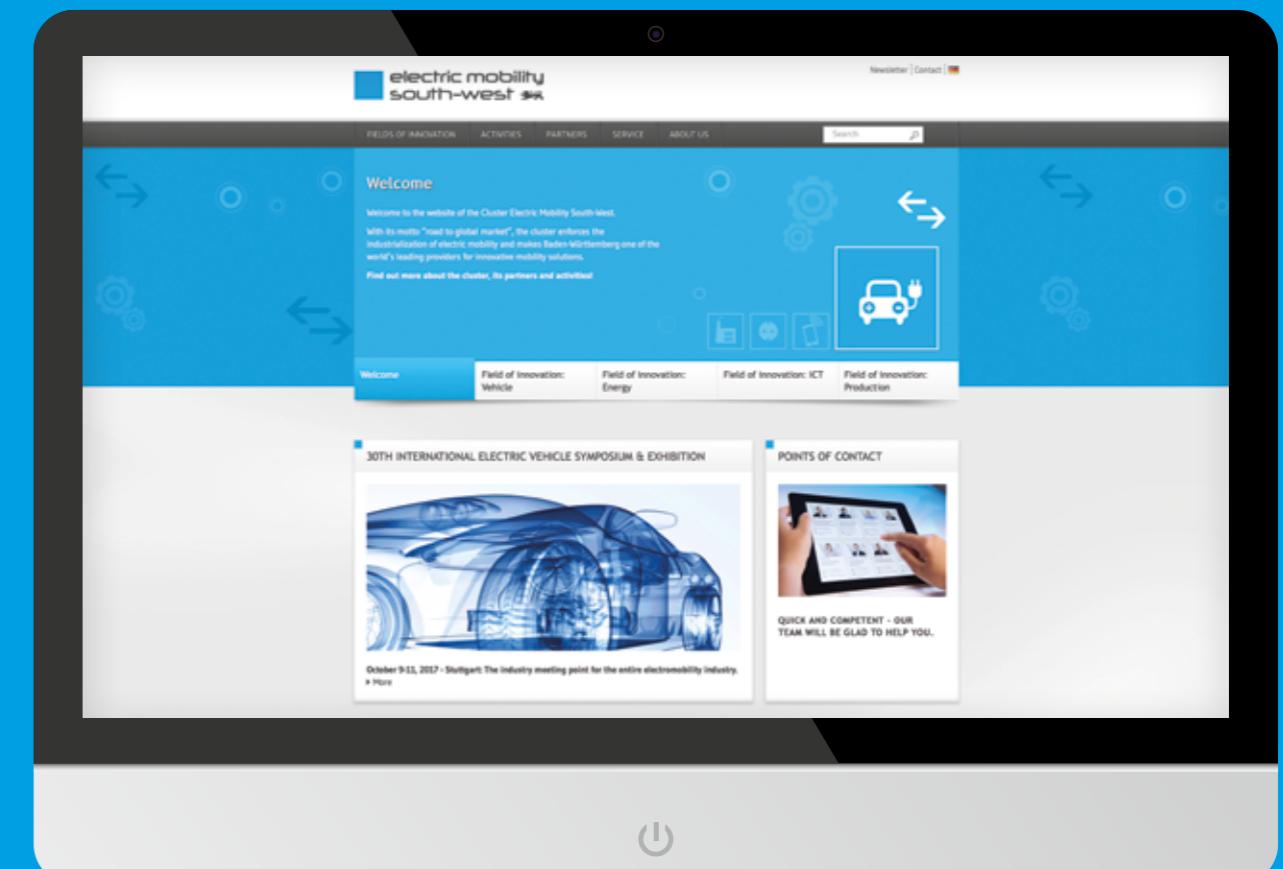
The partners of the cluster can be found at [www.emobil-sw.de/en](http://www.emobil-sw.de/en).

## Take advantage of our offer

As one of the most important regional networks for the mobility of the future, the Cluster Electric Mobility South-West joins the competences of industry, science and politics to shape the transformation of the mobility system.

For more information on the Cluster Electric Mobility South-West please approach the responsible point of contact at the State Agency for Electric Mobility and Fuel Cell Technology Baden-Württemberg e-mobil BW GmbH.  
Please find your point of contact at:

[www.emobil-sw.de/en](http://www.emobil-sw.de/en)





[www.e-mobilbw.de](http://www.e-mobilbw.de)

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