



ELECTRIC MOBILITY FLAGSHIP PROJECTS

Innovative Austrian R&D in the field of electric mobility



TABLE OF CONTENTS

Preface Norbert Hofer, Federal Minister for Transport, Innovation and Technology.....	4
Preface Theresia Vogel, Managing Director of the Climate and Energy Fund.....	5
Electric mobility – European and national strategies.....	6
Research and development for the mobility solutions of the future	8
Getting electric mobility moving – International trends.....	12
Electric mobility in Austria – Opportunities and outlook.....	14
Electric Mobility Flagship Projects – The Future – Made in Austria.....	18
Successes and future outlook – Evaluation of the programme	20
ELECTRIC MOBILITY FLAGSHIP PROJECTS.....	22
EMPORA 1 & 2	24
CROSSING BORDERS	28
VECEPT	30
eMPROVE	34
eMORAIL	36
SMILE – simply mobile.....	40
SEAMLESS	42
CMO	44
EMILIA.....	48
LEEFF	52
E-LOG-BioFleet	54
RE²BA.....	56
ETA.....	58
Forward-thinking R&D schemes from the latest call for projects	
EMPA-Trac	60
CO ₂ neutral ePort	61
MEGAWATT-LOGISTICS	62
FlyGrid.....	63
Electric mobility – From research to market	
NTT-Data	64
SMATRICS.....	65
E-mobility support programme for members of the public.....	65
Contacts.....	66
List of abbreviations	68
Sources	69
Imprint	70

SHAPING THE FUTURE OF MOBILITY TOGETHER



Photo: bmvit

Mobility is an important engine of economic growth and prosperity. However, a strong economic situation – such as the one we have been enjoying in Austria in recent years – brings with it high volumes of traffic and, in turn, rising CO₂ emissions.

Our long-term aim is to create a future with a largely CO₂-neutral transport sector. In order to achieve this, we will need a sustainable mobility system that encompasses every relevant aspect – from the vehicles and infrastructure right through to modern services for users.

Innovation and new technologies have a major role to play in shaping the mobility system of tomorrow. Electric mobility is a key technology that can form a central part of a joined-up and environmentally friendly overall system.

For many years now, the Federal Ministry for Transport, Innovation and Technology has been investing in research projects that focus on alternative drives and transport automation. The Federal Ministry for Transport, Innovation and Technology and the Federal Ministry of Sustainability and Tourism have been jointly working on an action plan for clean and competitive mobility since the first quarter of 2018.

The Climate and Energy Fund's "Electric Mobility Flagship Programme" is part of the joint support package that is designed to encourage the development of new technologies and bring together the expertise of various Austrian players.

By presenting the R&D results that have been obtained from the flagship projects so far, this brochure shows how we can shape the future of mobility together using innovations from Austria.

Norbert Hofer

Federal Minister for Transport,
Innovation and Technology

INNOVATIONS IN CLIMATE PROTECTION – ELECTRIC MOBILITY FLAGSHIP PROJECTS

A sustainable approach to mobility transformation – as championed by the Climate and Energy Fund – does not just help to achieve climate targets but is also opening up huge opportunities for Austria as a key business location.

For many years now, Austrian companies have been developing new and innovative technologies and products with a view to creating a mobility system that is fit for the future.

Electric mobility, in particular, holds massive potential for generating added value and new jobs. Experts believe that the expansion of electric mobility will create around 33,900 new jobs and generate around 3.1 billion euros of extra added value in Austria by 2030. Those are the findings of the study “E-MAPP: E-Mobility and the Austrian Production Potential”, which was carried out on our behalf.

Through our “Electric Mobility Flagship Programme”, we have been supporting various innovative and practically oriented projects since 2009. These are strengthening Austria’s position in the growing international market for electric mobility solutions and are putting Austrian know-how on the map.

Together with the Federal Ministry for Transport, Innovation and Technology (bmvit), this is enabling us to strengthen the Austrian automotive industry.

Through our support programme, we are addressing every aspect of the electric mobility system: as well as considering technological issues, the flagship projects also cover the applications, users and infrastructure involved. And the positive evaluation results confirm that we were right to concentrate strategically on this unique approach encompassing “User – Vehicle – Infrastructure”.

So far, we have supported a total of 21 forward-thinking projects by providing more than 53 million euros in funding. As a result, 244 project partners have been able to develop their ideas and demonstrator models, taking them closer to market readiness. We are very proud of the fact that some of these innovative solutions can already be found on Austria’s roads and are being successfully exported.

This is spurring us on in our joint quest to make mobility more climate-friendly and to harness the opportunities for Austria as a key centre for technology.



Photo: Climate and Energy Fund

Theresia Vogel
Managing Director of the
Climate and Energy Fund

ELECTRIC MOBILITY – EUROPEAN AND NATIONAL STRATEGIES



Photos: Climate and Energy Fund / Ringhofer

SOURCES

¹ Proportion of greenhouse gas emissions in Austria that are attributable to transport, Environment Agency Austria, www.umweltbundesamt.at/umweltschutz/verkehr/auswirkungen_verkehr/verk_schadstoffe/verk_treibhausgase/

² EU climate and energy goals http://europa.eu/rapid/press-release_IP-14-54_de.htm

³ Target for Austria
Environment Agency Austria, Klimaschutzbericht 2017 (Climate Protection Report 2017)
www.umweltbundesamt.at/fileadmin/site/publikationen/REP0622.pdf

⁴ White Paper on Transport
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:DE:PDF>

⁵ European Strategy for low-emission mobility
https://ec.europa.eu/transport/themes/strategies/news/2016-07-20-decarbonisation_en

Mobility is a basic human need. The extent to which our quality of life depends on being fully mobile is revealed, not least, by the increase in traffic volumes that can be seen all over the world, particularly in the main conurbations. However, mobility is also a key factor for our economic system, which now operates on a global scale. The other side of the coin is well known: transport is one of the main causes of climate change. In Austria, transport accounts for approximately 29% of greenhouse gas emissions. Since 1990, transport emissions have increased by approximately 67% within the country. In 2016, greenhouse gas emissions from transport increased by around 4.2% (or 0.9 tonnes of carbon dioxide equivalent) in comparison to 2015.¹

If we want our future to be one where we remain mobile – in both our private and business lives – a massive rethink will be required. For this, we will need mobility systems that are not only efficient, affordable and comfortable but that also use our resources sparingly at the same time. Electric mobility is one of the key technologies for shaping the mobility system of the future. As well as offering an opportunity to achieve significant reductions in greenhouse gas emissions from transport – and help create a sustainable mobility system – it also holds massive potential for generating added value and creating new jobs.

The framework for developing electric mobility in Austria is provided by climate and energy strategies at both a national and an international level.

STRATEGIC GOALS OF THE EU

With regard to the development of future transport systems, the European Union (EU) is pursuing a set of clear strategic goals. These are being championed by the following Directorate-Generals (departments) of the EU: Energy, Research and Innovation, Mobility and Transport, Environment, and Competition. In particular, the emission targets that have been

formulated within this context can only be achieved by using electrically powered vehicles.

EU climate and energy goals

The European Union has set itself the goal of gradually reducing greenhouse gas emissions by the year 2050. The 2020 climate & energy package (“20-20-20 targets”) and the 2030 climate & energy framework are intended to help transform the EU into a low-carbon economy by 2050. The following overall targets are to be achieved by 2030:

- > 40% fewer greenhouse gas emissions (compared with 1990)
- > 27% increase in energy efficiency (compared with the “business as usual” scenario)
- > 27% of total energy consumption to be supplied by renewable energy sources²

For sectors not included in the EU Emissions Trading System (ETS), national targets have been set for each Member State as part of the European Effort Sharing Decision. In the case of Austria, the draft version stipulates a reduction in emissions of 36% by 2030 compared with 2005 for sectors outside the ETS. This represents a substantial cut in CO₂ emissions as far as the transport sector is concerned.³

White Paper on Transport

The targets outlined in the White Paper on Transport can – like the others – only be achieved through electric mobility solutions. According to this document, the use of “conventionally fuelled” cars in urban transport is to be halved by 2030. Conventional vehicles are to be completely phased out in cities by 2050. In addition, CO₂-free city logistics are to be achieved in the major urban centres by 2030.⁴

European Strategy for low-emission mobility

The transition to low and zero-emission vehicles is a core objective of the European Strategy that was drawn up in 2016. This provides the framework for targeted measures that will help speed up the deployment of low-emission alternative energy for transport and remove obstacles to the electrification of transport.⁵

Reduction in CO₂ emissions of new passenger cars

In 2017, the European Commission proposed a set of new CO₂ emission reduction targets for passenger car fleets. These stipulate that the average CO₂ emissions – for both new cars and vans – will have to be 30% lower in 2030 than in 2021.⁶

Alternative fuels infrastructure

Environmentally friendly alternative fuels are set to become more prevalent in the future. The necessary infrastructure to support this will have to be set up in accordance with EU Directive 2014/94/EU. Among other things, this includes the infrastructure for partially and fully electric vehicles. The Directive stipulates that an “appropriate number” of charging points are to be established by 2020. Each Member State was required to devise its own national policy framework for this purpose. In Austria, this took the form of the National Policy Framework entitled “Saubere Energie im Verkehr” (“Clean Energy in Transportation”).⁷

AUSTRIA'S POSITION REGARDING ELECTRIC MOBILITY

The Federal Ministry for Transport, Innovation and Technology and the Federal Ministry of Sustainability and Tourism have been working on an action plan for clean and competitive mobility since the first quarter of 2018. A clear set of measures are to be defined as part of this process, which involves representatives from various Austrian ministries, federal provinces, municipalities, companies, associations and scientific institutions.

National Policy Framework “Saubere Energie im Verkehr” (“Clean Energy in Transportation”)

This document, which was drawn up in 2016, implements – at a national level – parts of Directive 2014/94/EU of the European Parliament on the deployment of alternative fuels infrastructure. It lays down a national policy framework for developing the alternative fuels market in the transport sector and for setting up the corresponding infrastructure.

Road traffic is by far the biggest source of CO₂ emissions in Austria. In light of this, diesel and petrol consumption are to be reduced significantly by 2030 and beyond.

In addition to making use of first and second/third-generation biofuels, something else that is seen as a very important step is switching to alternative fuels based on renewables in transport and electric mobility. By the year 2050, Austria hopes to have created a transport sector that is not only largely CO₂-neutral but is also socially compatible, efficient and safe – while working on the premise that the mobility demands of people and goods must continue to be met in the future. In the medium to long term, this means that road traffic will have to switch predominantly to zero-emission vehicles based on the use of renewables and to ultra-low-emission vehicles. A key part of creating a modern and efficient overall transport system is to electrify the modes of transport.⁸



Photo: Climate and Energy Fund / Ringhofer

SOURCES

⁶ Reduction in CO₂ emissions of new passenger cars
https://ec.europa.eu/transport/modes/road/news/2017-11-08-driving-clean-mobility_en

⁷ Directive 2014/94/EU on the deployment of alternative fuels infrastructure
<http://eur-lex.europa.eu/eli/dir/2014/94/oj>

⁸ Austrian strategic framework „Saubere Energie im Verkehr“
www.bmvit.gv.at/verkehr/elektromobilitaet/downloads/strategierahmen.pdf

The expansion of electric mobility is central to achieving our goal of reducing exhaust emissions and making transport more environmentally friendly through the gradual decarbonisation of this sector. To make this happen, it is very important that we set development objectives for electric mobility and make adjustments to the necessary legal framework (e.g. so that it becomes easier to install the charging infrastructure) while also expanding tax incentive systems to encourage the purchase of vehicles that are more efficient and lower in emissions. Alternative drive designs need to be researched and supported in a technology-neutral manner – and we believe it is absolutely vital to keep the focus here firmly on the goal of long-term decarbonisation. Climate protection policy in the area of transport must be seized as an opportunity to benefit both the economy and the environment alike. That is why we have been strongly supporting Austrian research into electric mobility for years and will be emphasising alternative drive technologies as part of the latest research programmes.

ANDREAS REICHHARDT

Secretary General, Federal Ministry for Transport, Innovation and Technology



Photo: bmvit / Johannes Zinner

RESEARCH AND DEVELOPMENT FOR THE MOBILITY SOLUTIONS OF THE FUTURE



Photo: Climate and Energy Fund /
Astrid Bartl

Sustainable mobility concepts rely on having a multimodal transport mix, whereby different forms of mobility (private and public plus motorised and non-motorised) are combined to create one low-emission system. Electric mobility is regarded as a key building block for creating the mobility system of the future. However, the transition to electric mobility is about much more than simply introducing new vehicles. And it does not just affect the automotive industry and its suppliers. Rather, the actual implementation process brings various new players into the market. In the first instance, this naturally means the power industry, whose task it is to provide the power (preferably from renewable sources) and set up the appropriate charging infrastructure. In addition, information and communication technologies (ICT) are coming to play an

increasingly important role. Intelligent concepts are required to enable the networking of users, vehicles, charging stations and power companies. The degree of complexity involved in setting up the necessary data links is considerably greater than has traditionally been the case, all the more so because Austria – in particular – thinks that getting on board with electric mobility is a powerful force for promoting intermodal transport concepts.

Given the many factors and stakeholders involved, a multitude of research fields associated with electric mobility are beginning to emerge. In addition to technological concepts and development activities relating to vehicle and infrastructure components, these also encompass system-related, political, economic and social aspects as well.



Photo: IV / Kurt Prinz

To successfully overcome the challenges of our time and achieve the core aims of energy and climate policy, a forward-thinking industrial policy will be required at both a national and a European level. Research, technology and innovation can improve our competitive advantage and are central to ensuring resource efficiency and sustainability.

With its comprehensive approach, the Climate and Energy Fund offers support instruments at every stage of the innovation chain and plays a vital role in supporting innovative solutions in areas such as electric mobility. To put Austria at the forefront of innovation, it is also a question of harnessing the complementarity with European programmes with the aim of reinforcing strengths and further expanding key technologies.

GEORG KAPSCH

President of the Federation of Austrian Industries

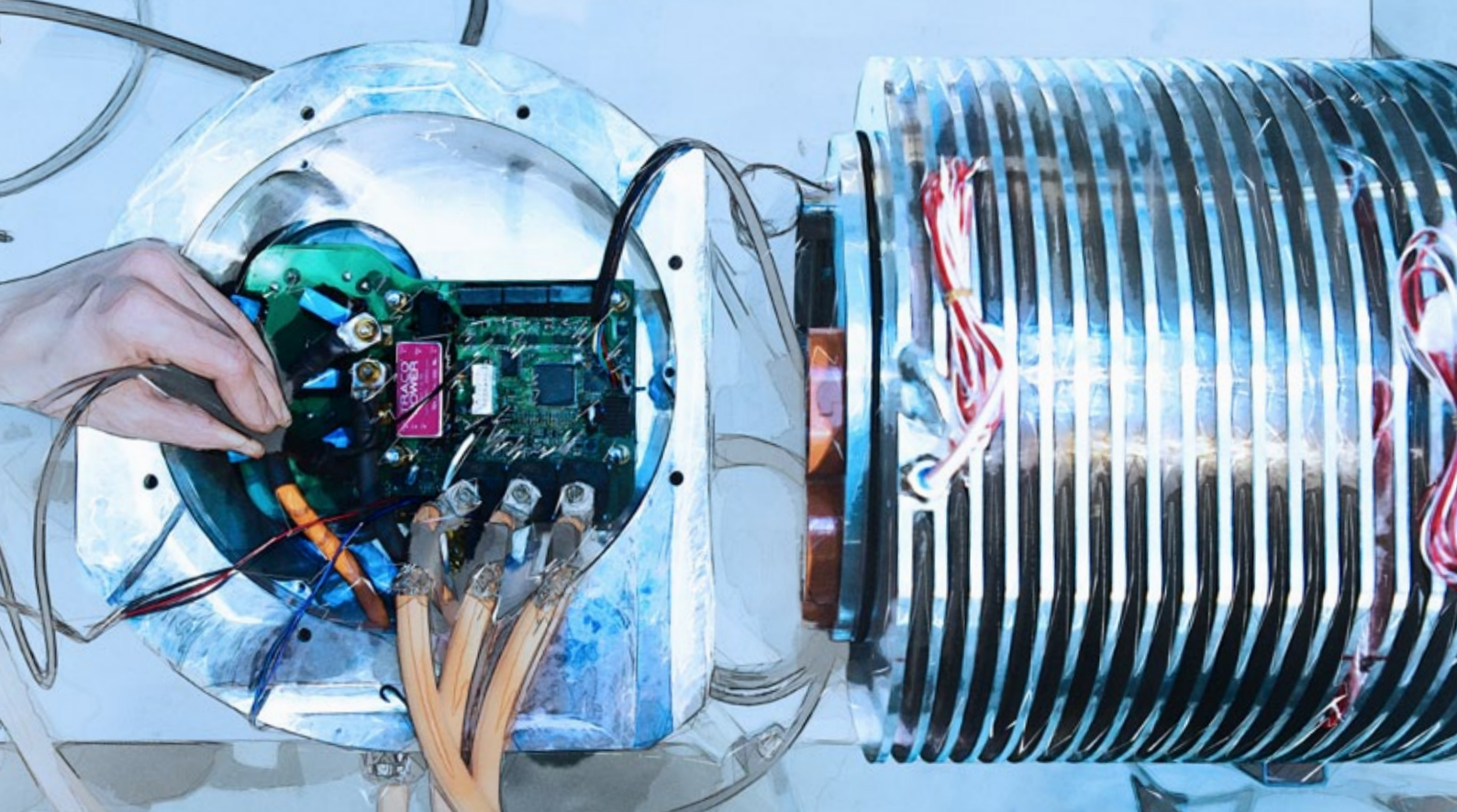


Photo: Climate and Energy Fund / Astrid Bartl

AUTOMOTIVE TECHNOLOGY FIELDS

In the area of vehicle technology, one of the main focuses is on developing alternative power trains. Firstly, this is a question of devising “complete system” concepts and operating strategies. Secondly, it entails developing and enhancing various components, such as electric engines, high-performance electronics and control technology. Today’s modern vehicles have to respond to external conditions in real time and are expected to optimise all operating parameters continually. For this, they need information from advanced sensor components and high-performance electronics of the same calibre to process this information.

The psychological barriers preventing the spread of electric vehicles remain the same as before, namely the short driving range and the high cost of the batteries. The performance and cost of the rechargeable batteries will

be crucial to the success of electric mobility. Enhancement of the battery technology is mainly concerned with energy density, safety during use, deep-cycle resistance and service life. R&D in this area is heading in several different directions, e.g. how to combine batteries with high-performance capacitors or how to develop batteries in combination with fuel cell range extenders.

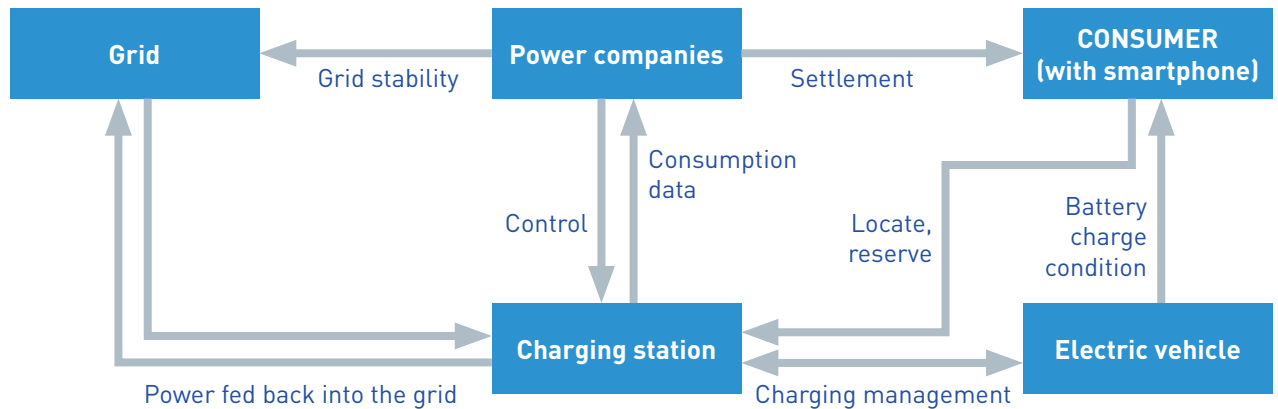
Within this context, life cycle analyses are another important element, i.e. the process of considering the total ecological and economic costs of the battery from the availability of the raw materials right through to recycling.

The integration of energy storage systems into the vehicle is also imposing new requirements in terms of the bodywork. By using new light-weight materials such as carbon fibre reinforced plastics, you can keep the total weight of the vehicle to a minimum, thereby extending the range. >>>



Photo: Climate and Energy Fund / Astrid Bartl

In order to develop a complete system of electric mobility, vehicle manufacturers, power companies and ICT specialists will all have to cooperate with one another.



Source: Fraunhofer IAO (institute for work management and organisation), graphic: Waldhör KG

ELECTRIC MOBILITY SYSTEM COMPONENTS

Research and development in the field of electric mobility must be geared towards creating a fully integrated complete system. Vehicle technology, infrastructure, energy supply and intelligent services for users must all link up if the electric mobility system is to work and become accepted.



Photo: Climate and Energy Fund / Astrid Bartl

TECHNOLOGY FIELDS RELATING TO ENERGY AND INFRASTRUCTURE

Anyone who relies on a battery-powered vehicle to get around needs the corresponding infrastructure to be in place so that they can charge up their car reliably and conveniently. Along with access to an extensive network of charging stations, user-friendly technologies are also required to enable easy operation.

Without a sustainable energy supply, there is no prospect of creating an environmentally friendly form of mobility that is fit for the future. If the use of electric vehicles leads to increased demand for power from the public grid, solutions will have to be found to facilitate intelligent grid integration and incorporate renewable energies. The key research areas here are: central or decentralised storage management, the power demand associated with an increase in the number of electric cars, charging control and storage management in general. On the other hand, the process of incorporating electric vehicles into the grid introduces new storage capacity because the vehicle batteries can be used as external power storage systems. As part of "vehicle-to-grid" concepts (V2G), intelligent technologies are being developed for controlling charging and discharging processes in the smart grid. The idea is to use the batteries of electric vehicles as small incoming and outgoing feeders that can be connected as required.

NEW PERSPECTIVES THANKS TO INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)

The overall system will only function if the users, vehicles, charging station and power companies are all connected to one another in the future via communication technology. Vehicle manufacturers, power companies and ICT firms must work together to develop integrated solutions. Users need to know where they can charge up their car, when their battery is full and how to pay for what they consume. The power companies need the consumption data to ensure the stability of the grid through skilful management of the charging process. The information and communication technologies will form the interface between the users and the operating companies.

If data from public transport operators and other providers of mobility services can be integrated into a single system, this will create some of the most important conditions for "integrated mobility". Users who are able to get around flexibly and conveniently by relying on various interconnected mobility services (public transport, e-car sharing, e-bikes, hire bikes, etc.) will barely miss having their own car. The key to setting up such networks already exists: over 1.4 billion smartphones are sold world-wide every year.

Austria is a leading global supplier to the automotive industry. Approximately 450,000 people are employed in this sector and are responsible for creating 43 billion euros of added value. To make sure this role can be maintained in the future and to ensure progress in terms of energy, climate and environmental policy, bmvit has been supporting the development of electric vehicles and the associated components by running specific programmes for more than 15 years.

The flagship projects of the Climate and Energy Fund are an extremely important tool in bmvit's effort as it strives to meet the challenges of industrial policy while also hitting the binding targets of the European Union in the area of climate policy. This is because they close the gap between technology development and commercialisation by relying on system integration and serving as a visible demonstration of Austria's technological expertise. For small countries with a strong supply industry like Austria, cooperation between public and private partners as well as collaboration at an international level are extremely important. That is why, in addition to supporting individual projects, bmvit also supports PPP such as A3PS and is heavily involved in transnational research cooperations as part of the IEA, IPHE and the Fuel Cells and Hydrogen Joint Undertaking.

EVELINDE GRASSEGGER

Head of Unit, Mobility and Transport Technologies
Federal Ministry for Transport, Innovation and Technology (bmvit)



Photo: bmvit



Photo: Climate and Energy Fund / Astrid Bartl

MORE KNOWLEDGE ABOUT FUTURE USERS

The introduction of electric mobility calls for new transport concepts and a new approach to mobility management. Alongside the economic and ecological aspects, the general political framework also has a role to play in this regard. However, the ability of electric mobility to spread ultimately comes down to whether it is sufficiently accepted by the population. In this sense, it is extremely important to analyse user behaviour, user acceptance and any barriers.

What ranges are required, how reliable do electric vehicles have to be, how much can they cost and under what conditions will users be prepared to change their mobility behaviour? Consequently, demonstrations and test runs involving the new technologies and concepts, and the systematic evaluation of empirical user data obtained from pilot projects will be vital when it comes to the further development of electric mobility.

GETTING ELECTRIC MOBILITY MOVING – INTERNATIONAL TRENDS

SOURCES

¹ IEA Global EV Outlook 2017, Paris 2017

² China Automotive Information Net, Bloomberg New Energy Finance; Handelsblatt, www.sueddeutsche.de/wirtschaft/e-mobilitaet-china-fuehrt-quote-fuer-e-autos-ein-1.3687137

³ Press Release E-Mobility: Current Sales Trends in Major Global Automotive Markets, Prof. Stefan Bratzel, Center of Automotive Management (CAM), Bergisch Gladbach, 2017-10-27, www.auto-institut.de

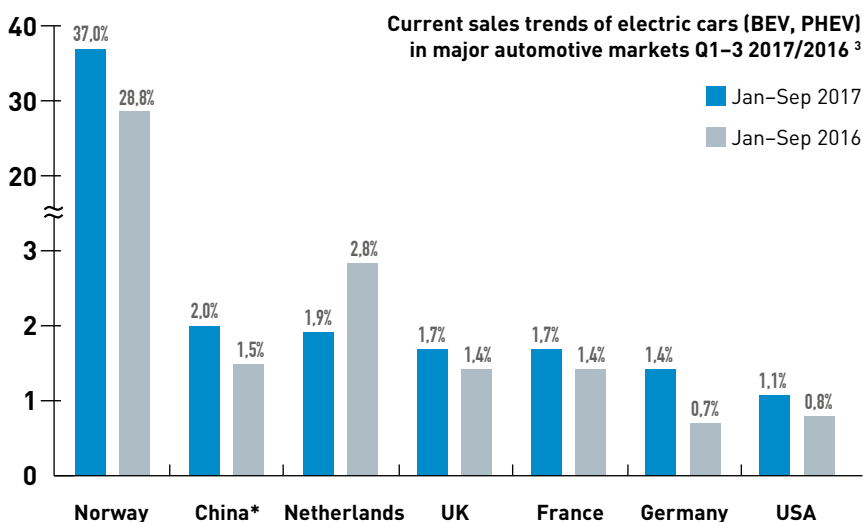
⁴ Elektromobilität in Österreich, Zahlen und Daten 2017, bmvit, erstellt von AustriaTech; 1/2018

At an international level, the electrification of vehicles is set to increase even further in the future. Aside from technological improvements and reductions in the cost of purchasing vehicles, growth will also depend on the general political and economic conditions that apply in each case. In 2016, approximately 440,000 fully electric cars were sold worldwide (750,000 if plug-in hybrids are also included). This means that the global population of electric vehicles (including plug-in hybrids) now stands at more than 2 million.¹

China, the world's largest auto market, intends to introduce a 10% electric mobility quota for new cars that will apply from 2019. In light of this, China is expected to become the lead market for electric mobility, with mass production then gathering momentum as costs drop.²

In the great automotive nations, the registration figures for battery electric vehicles (BEV) and plug-in hybrid vehicles (PHEV) are still fairly insignificant.

Within the European Union, Austria belongs currently to the leaders with regard to the proportion of new registrations made up of electric cars. In 2017, electric vehicles (BEV and PHEV) accounted for 2.2% of newly registered vehicles; in 2016, the proportion was just 1.54%.⁴



*rounded, incl. commercial vehicles; China, USA and Norway incl. fuel cell; Manufacturers in the USA partially appreciated



Photo: VERBUND AG

Electric mobility is the key to achieving a sustainable reduction in the energy consumption and CO₂ emission levels. Austria has the best foundations for electric mobility because most of its electricity is already produced from renewable sources. VERBUND, which generates approximately 95% of its electricity from renewables, has been firmly behind electric mobility for years and is championing projects and e-mobility programmes across Austria and at an international level. Electric mobility is enabling us to realise our vision of pollution-free private transport, which spans everything from quiet, emission-free towns/cities to smart homes, where self-generated electricity can be flexibly stored and fed into the vehicle.

WOLFGANG ANZENGRUBER

Chairman of the Managing Board of VERBUND AG

Mobility is a basic need of society. Alternative drive concepts and alternative fuels are important future technologies with massive potential for both large and small companies that are able to harness their specific strengths. With their diverse range of solutions, Austrian business and industry are at the vanguard of technology in various areas, including sustainable mobility. There are numerous export opportunities – and they are truly being seized.

Now the focus must be on increasing Austrian added value and the jobs that go hand in hand with this. The aim here is to strengthen R&D and the production of cutting-edge technology in Austria and to bring about sustainable reductions in transport emissions. The ability to make further improvements in vehicle noise emissions, pollutant emissions and energy consumption rests on the following key pillars: the technical advancement of the vehicles and drive technologies as well as the fuels and battery systems. In order to strengthen Austria's status as a location for business and bring about the export of technology, it will be necessary to prioritise R&D, innovation and technology development. In terms of industrialisation and product implementation, it is very important to generate production within Austria. In this sense, the "Electric Mobility Flagship Programme" is helping to support and press ahead with the necessary transformation of the transport sector.



Photo: WKO

CHRISTOPH LEITZ

President of the Austrian Federal Economic Chamber (WKO)
President of the European Economic Chamber

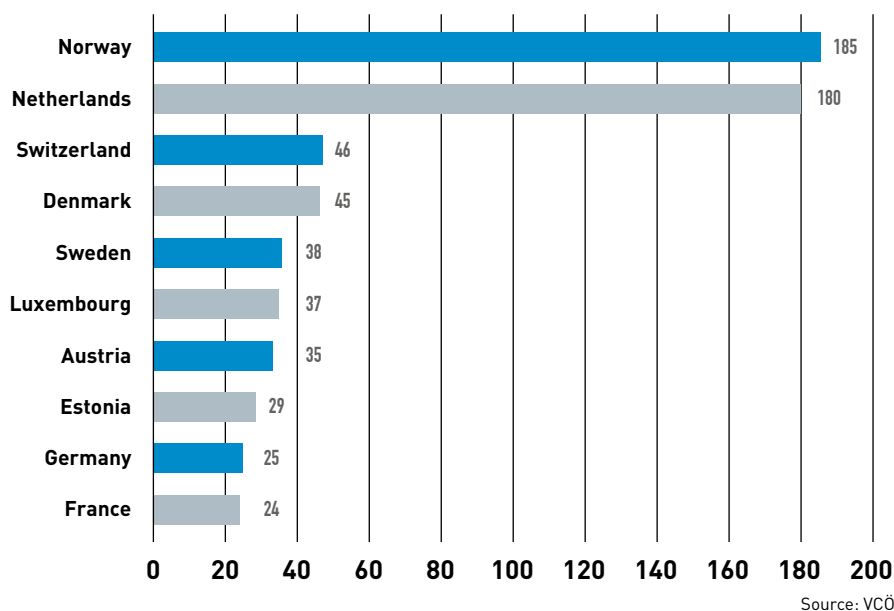
At the moment, the international leader is Norway. This can be explained by the obvious tax breaks and the many accompanying incentives such as free municipal parking and access to bus lanes.

The aim is for all vehicles registered in Norway as of 2025 to be electrical. Various tax benefits, such as exemption from VAT (25% of the purchase price) and from registration tax (which is similar to the Austrian NoVA tax), mean that electric cars are generally considered the cheapest option in Norway today already.¹

According to a recent study by the VCÖ, Austria ranks seventh out of all European countries and fifth within the EU for public charging stations with 35 for every 100,000 inhabitants. The European leaders are Norway and the Netherlands with 185 and 180 electric charging stations per 100,000 inhabitants respectively.²

In total, there are now more than 104,000 public charging stations within the EU.

Charging infrastructure comparison internationally
Charging stations per 100,000 inhabitants



SOURCES

¹ M. Aasness, J. Odeck: The increase of electric vehicle usage in Norway: incentives and adverse effects, *European Transport Research and Review*, 7: 34, 2015

² Austria in top ten for charging stations
www.vcoe.at/news/details/vcoe-oesterreich-bei-e-ladestationen-in-europa-unter-top-10-in-niederoesterreich-die-meisten-e-ladestationen

Charging infrastructure comparison International/Austria
<https://smatrics.com/news/geladen-wird-zuhause-oder-am-arbeitsplatz>

ELECTRIC MOBILITY IN AUSTRIA – OPPORTUNITIES AND OUTLOOK

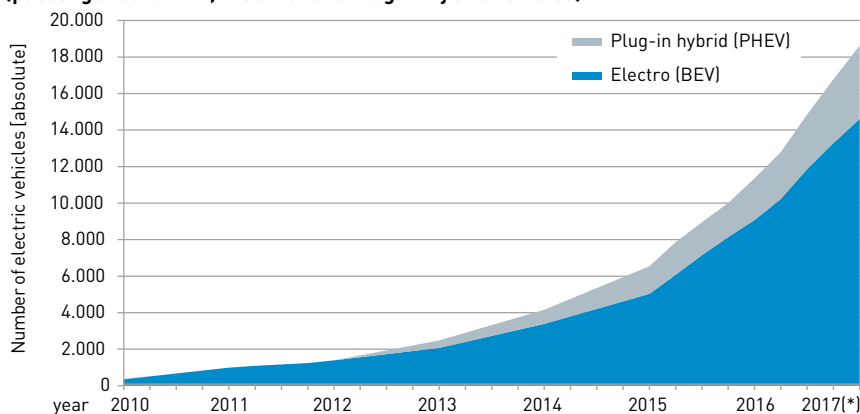


Photo: Climate and Energy Fund / Ringhofer

In Austria, the high proportion of renewables within the energy mix provides a solid foundation for creating a sustainable and environmentally sound mobility system. As a key technology, electric mobility holds massive potential for generating high levels of added value and employment in Austria in the long term. Austrian industry and a large number of innovative companies are supplying cutting edge technology for vehicles, infrastructure and smart mobility solutions.

The acceptance of electric mobility has been increasing in Austria for years. Public transport in many of the conurbations is already being enhanced thanks to the introduction of environmentally friendly hybrid and electric buses. E-taxi and e-car sharing concepts are being refined and trialled in various regions. Austria is already home to more than 350,000 electric bikes and the number of electric cars is constantly on the increase.

**Vehicle inventory of electric vehicles (Class M1)
(passenger cars - M1; Electric- and Plug-in hybrid vehicles) ¹**



¹ Source: Statistik Austria; Data status: 31.12. of the corresponding year; (*) preliminary results based on reports from the „Association of Insurance Companies of Austria“ (VVO); Presentation: AustriaTech

The volume of electric cars (BEV and PHEV) registered in Austria in the first half of 2017 was about 40% higher than for the same period in 2016. Back in 2011, there were 989 electric and plug-in vehicles on Austria's roads but by the end of 2017, this figure had climbed to a staggering 18,626 vehicles. Even the number of electrically powered models available on the Austrian market is continually rising.¹

Nevertheless, electric vehicles remain a niche product within the private transport sector. For this reason, research facilities and companies are working on new solutions to break down the psychological barriers that are known to put people off (vehicle range is too short, high purchase costs and inadequate charging infrastructure).



Photo: Fronius International GmbH

In the area of electric mobility, Fronius is focusing on alternative drive technologies for logistics vehicles. New developments, such as the lithium-ion battery and the hybrid drive, have the potential to become established solutions within intralogistics and to pose a serious challenge to conventional batteries – electric industrial trucks are not only powerful; they also help protect health and the environment.

However, for us, alternative non-fossil drive solutions are just one part of a bigger picture: comprehensive energy supply based on the use of renewables. The Fronius vision is called “24 hours of sun”. Thus, the future aim is for everyone to be able to charge up their electric vehicle at home easily and conveniently – using electricity produced by their very own photovoltaic system. In the future, companies will also be able to offer their employees and customers a suitable charging infrastructure that relies on networked photovoltaic systems. In addition, they will be able to generate green hydrogen remotely for their own vehicle fleets to enable long-distance journeys.

ELISABETH ENGELBRECHTSMÜLLER-STRAUSS

CEO of Fronius International GmbH

The stated aim of the Austrian Federal Government is to rely on innovation to create a mobility system that is both sustainable and climate-friendly. Electric mobility is a core ingredient for achieving this essential decarbonisation. That is why the Federal Ministry for Transport, Innovation and Technology is running the “Electric Mobility Flagship Projects” programme to help Austrian companies and research facilities to develop system solutions for realising the zero-emission mobility of the future. I am particularly pleased to see that new companies have been established in the area of electric mobility with the support of the programme, and that it has helped existing companies to further their electric mobility activities. In this way, the opportunities associated with decarbonisation are being harnessed and we are seeing jobs being created and value being added in key areas of technology within Austria.

HENRIETTE SPYRA

Strategic Coordinator Mobility Transformation & Transport Decarbonisation
Federal Ministry for Transport, Innovation and Technology (bmvit)



Photo: bmvit

FUTURE MARKET FOR ELECTRIC MOBILITY

As a technology field, electric mobility holds massive potential for generating added value and creating new jobs. There are excellent opportunities here for Austrian companies to position themselves internationally with new products and technologies.

The greatest potential for Austrian-based producers lies in the manufacturing of electric vehicle components and subcomponents, at both the infrastructure solution and production technology levels. >>>

The 2016 E-MAPP study found that electric mobility held enough potential for Austria to create 33,900 jobs and generate around 3.1 billion euros of extra added value by the year 2030.

33,900 new jobs
3.1 billion euros
added value by 2030

E-MAPP STUDY E-MOBILITY AND THE AUSTRIAN PRODUCTION POTENTIAL

This study was carried out in 2016 by Fraunhofer Austria, Austrian Mobile Power and the Virtual Vehicle Research Center on behalf of the Climate and Energy Fund. It examined the added-value and employment potential that Austria could unlock as a result of the transition to electrically mobility. The automotive industry is currently in the process of transitioning to pure electric powered vehicles. One of the key bridging technologies during this phase are hybrid electric propulsion systems.

Renowned OEMs hold development and production sites in Austria which belong to the most efficient ones globally developing and producing state-of-the-art and future engine and transmission concepts. Austria has a strong electrical and electronics industry, which produces important components required by the electric mobility sector. The focus of this study lies on passenger car components, charging infrastructure concepts as well as associated production technologies and processes of selected components within the e-mobility value chains.

SOURCE

E-MAPP
E-Mobility and the Austrian Production Potential, Fraunhofer Austria, Austrian Mobile Power and the Virtual Vehicle Research Center on behalf of the Climate and Energy Fund, 2016

www.klimafonds.gv.at/assets/Uploads/Presseaussendungen/2016/eMapp/E-MAPPStudie.pdf



Photo: Martin Rumersdorfer

Schachinger Logistik is investing heavily in the development of modern sector-specific logistics with a view to creating proactive and sustainable solutions – primarily for smart city logistics, last-mile logistics and a rapid transition to post-fossil mobility. Out of the six ambitious research projects that have been initiated so far (some at an international level), three would have been utterly inconceivable without the professional commitment of the Climate and Energy Fund. These are EMILIA, LEEFF and the MEGAWATT project that is due to get under way in 2018.

With the Climate and Energy Fund by our side as a reliable partner, we are managing to drive electric mobility forward in Austria as a member of strong consortia. We are rapidly catching up with our European competitors and are even delivering flagship projects that are creating a dynamic ecosystem in Austria and are attracting a lot of interest at international conventions.

The consortia are generating new partnerships and a broad range of knowledge that is being processed, disseminated and implemented by the Council for Sustainable Logistics (CNL) and the ZV and BVL logistics associations. As a result of these dynamics, companies and associations are becoming increasingly integrated and are raising the future viability of Austrian mobility to a whole new level. This is rapidly creating opportunities for trialling the newly developed technologies on the market. Without public support and the support structure provided by the Climate and Energy Fund, this positive development would never have been possible.

MAX SCHACHINGER

Schachinger Logistik Holding GmbH



Photo: Climate and Energy Fund / Ringhofer

QUELLEN

¹ Austria is in the international top ten for charging stations
www.vcoe.at/news/details/vcoe-oesterreich-bei-e-ladestationen-in-europa-unter-top-10-in-niederoesterreich-die-meisten-e-ladestationen

² e-tankstellen-finder.com
 retrieved 31 January 2018

³ <https://smatrics.com/ladenetz>

⁴ Bundesverband Elektromobilität Österreich
www.beoe.at/ladenetz/

SMART INFRASTRUCTURE

Across Europe and in Austria, the number of charging stations and charging points at locations such as shopping centres, service stations, garages and public car parks is constantly growing. Many of the projects undertaken as part of the “Flagship Projects” programme – such as EMPORA, CMO or CROSSING BORDERS – have laid the foundations for the smart infrastructure of the future.

With 35 public electric charging stations for every 100,000 inhabitants, Austria ranks 7th out of all European countries and 5th within the EU (as revealed by a VCÖ analysis carried out in 2017).¹

According to “E-Tankstellen-Finder” (a website for locating electric service stations), there were around 3500 publicly accessible charging points with a charging power of up to 22kW in Austria at the beginning of 2018 and another 640 with a charging power of more than 22kW.²

Smatrics has set up a high-power charging network that covers the whole of Austria and

which already offers more than 435 charging points. Around 210 of these are high-speed points with a power of 43 or 50kW – located approximately 60km apart on motorways and in the main conurbations.³

The eleven power companies that make up the “Bundesverband Elektromobilität Österreich” (Federal Association of Electromobility Austria) are responsible for operating another large charging network within Austria. This comprises almost 2000 charging points that can all be used via the same app or chip card. The interoperability concept for the systems was developed and implemented as part of another project supported by the Climate and Energy Fund.⁴

There are numerous apps that provide live information about vacant charging points. Customers are usually billed per unit of time rather than in kilowatt hours to eliminate waiting times for other users.

Photo: Climate and Energy Fund / Astrid Bartl



SUSTAINABLE ENERGY SUPPLY

The latest version of the “Ökobilanz alternativer Antriebe” (a life cycle assessment of alternative drives) published by the Environment Agency Austria reveals that electric and fuel cell vehicles perform significantly better than conventional passenger cars. For the purpose of this study, the experts considered the environmental impact throughout the entire life cycle of the vehicles, from production and operation right through to disposal.

For an electric vehicle, the ideal result is if 100% of the electricity used to power the vehicle comes from renewable energy sources. When the entire life cycle of the vehicle is considered, a fully electric battery vehicle produces 70–90% fewer greenhouse gases than a fossil-powered passenger car.¹

Austrian companies are actively involved in the area of electric mobility and are busy developing solutions to create a user-friendly infrastructure. The core tasks are to ensure a secure and sustainable power supply and to integrate electric vehicles into the power networks intelligently. By incorporating electric mobility into our energy system, business and industry are making a major contribution towards reducing CO₂ emissions.

If 10% of all passenger cars in Austria were to run on electrical power, the annual demand for electricity would increase by 1.3TWh, representing a rise of just 1.8%. To power a million vehicles, it would have to rise by 2.6TWh or 3.6%. Even if the full number of passenger cars currently in existence were to switch over to electrical power, Austria's electricity demand would only increase by around 18% compared to its current annual level of approximately 70TWh, equating to a rise of 13TWh.²

QUELLEN

¹ Environment Agency Austria: Ökobilanz alternativer Antriebe (life cycle assessment of alternative drives) www.umweltbundesamt.at/fileadmin/site/publikationen/DP152.pdf

² Faktencheck Klima- und Energiefond (Fact Check of the Climate and Energy Fund), 2017, p.11, own calculations

Technological developments in the area of electric mobility have come a long way. All the elements that are required for electric mobility to make a breakthrough are now in place and even the ranges of the electric vehicles will cease to be an issue within the foreseeable future. There are two things that are still lacking: firstly, we need the individual components to be linked up so that they form a complete system and, secondly, we need to win the acceptance and trust of users in relation to this new technology.

The eMORAIL and eMORAIL advanced flagship projects show how completely new services – but more importantly, services that are tailored to the needs of the market – can be created by linking electric mobility to public transport, and that people are also willing to accept these services. The SEAMLESS project is another example of solution development work that includes studies of user acceptance as one of its core elements. As far as I am concerned, the most urgent research issue that needs to be addressed over the next few years is how to incorporate a highly diverse set of demands into technological developments.

ANGELIKA RAUCH

Member of the BieM (Bundesinitiative eMobility Austria) Managing Board



Photo: Reinhard Reidinger

ELECTRIC MOBILITY FLAGSHIP PROJECTS

THE FUTURE – MADE IN AUSTRIA



Photo: Climate and Energy Fund / Astrid Bartl

The automotive world is being turned upside down. Not only are climate targets and emission regulations becoming increasingly ambitious but a change is taking place in people's thinking – as can be seen, for example, from the declining sales figures for diesel vehicles, especially in the consumer customer segment. On top of that, technological development is racing ahead and although this is not confined to the area of electric mobility, it is particularly apparent there.

All these factors mean that the automotive industry is undergoing a process of transformation, the speed of which is being strongly dictated by external factors and which is happening much faster than many would have believed possible just a few years ago.

As far as Austria is concerned, this development is of particular relevance in two ways. Firstly, the country's economic structure is very heavily geared towards the automotive sector. For instance, the automotive industry accounts for 450,000 jobs and is worth 43 billion euros in sales.¹ Secondly, transport is responsible for generating 44.7% of greenhouse gas emissions in the non-ETS sectors (those outside the emissions trading system).²

QUELLEN

¹ www.fahrzeugindustrie.at/zahlen-fakten/wirtschaftsfaktor-automobil/

² www.umweltbundesamt.at/aktuell/presse/lastnews/news2017/news_170831/

It was in light of all this that the Climate and Energy Fund initiated the “Electric Mobility Flagship” research programme back in 2009. The aim of this research, which is being conducted close to the market, is to prepare for and support the transformation and greening of the Austrian automotive (supply) industry. Not only is this promoting proactive climate protection; it is also securing prosperity and jobs within Austria.

Since 2009, 21 flagship projects and 244 project partners have received around 53 million euros of funding in the course of 9 rounds of calls for proposals.

Right from the start, it was decided that the programme design should be based on a technologically neutral and holistic approach. Electric mobility can only function correctly if all parts of the system – from the vehicle and the infrastructure right through to the users – are perfectly coordinated with one another. All relevant areas have been addressed as part of the programme, which has created an opportunity for stakeholders from all kinds of industrial and business segments (such as automotive engineering, software development, usability optimisation and even transport planning) to tackle the issue of electric mobility together and in a highly focused manner.



Photos: Climate and Energy Fund / Astrid Bartl





Photos: Climate and Energy Fund / Astrid Bartl

Research and development are crucial to strengthening Austria's ability to compete as a key centre of technology. This is particularly true in the case of electric mobility. The framework conditions, technologies and business models within this area are changing rapidly and the transformation that this has triggered is a major factor for Austria as a country dominated by the automotive supply industry.

Since 2009, the Climate and Energy Fund has – in light of this – been successfully supporting electric mobility research projects that are conducted close to the market. It does so based on the guiding principles of technology neutrality, having a clear mission and viewing electric mobility in holistic terms. This is really helping to strengthen the innovative power of the Austrian economy while at the same time actively supporting climate protection.

GERNOT WÖRTHER

Project Manager and Controller, Climate and Energy Fund



Photo: Climate and Energy Fund

21 projects / 244 project partners

9 calls

Funding of 53 million euros

Thanks to this fully comprehensive and mission-oriented approach, projects have been initiated that allow different stakeholders to work together on solutions and network with each other, leading also to new collaborations. This was consciously supported and promoted by the Climate and Energy Fund through advisory committees and accompanying measures for disseminating information.

Over recent years, it has become increasingly apparent just how quickly and dynamically electric mobility is developing, along with its areas of application.

At the beginning of the programme, many basic technological questions were still unanswered and so most of the research questions focused on passenger cars and the necessary infrastructure and user requirements.

In recent years, the emphasis has shifted to larger vehicle categories (from light commercial vehicles and special-purpose vehicles right through to HGVs) and the infrastructure required for these areas of application, plus the higher charging power that will be needed and intelligent charging management.

SUCCESSSES AND FUTURE OUTLOOK – EVALUATION OF THE PROGRAMME

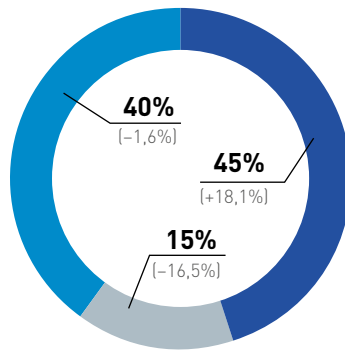


Photo: Climate and Energy Fund / Astrid Bartl

SOURCE
Evaluierung des Forschungs- und Technologieprogramms „Leuchttürme der Elektromobilität“ im Auftrag des Klima- und Energiefonds (Evaluation of the “Electric Mobility Flagship Programme” for research and technology on behalf of the Climate and Energy Fund), Prognos AG, Berlin 2017

What technology/topic is the primary focus of your activities as part of the project?

- Vehicle technology (including energy storage)
- Infrastructure technologies (intelligent charging stations, grid integration etc.)
- Applications and users (integration into the transport system etc.)



In brackets: percentage change since 2013

Source: Prognos AG

The programme focuses on all relevant areas of electric mobility, with the flagship projects covering the topics of vehicle technology, infrastructure technologies and applications/users.

The support programme relies on a holistic approach that is both mission-oriented and system-focused. Together with the proactive programme management, this has helped the Electric Mobility Flagship Projects to make very successful progress over recent years. When the programme was evaluated in the autumn of 2017, the findings were extremely positive.

The programme is very close to the business world (75% of participants are companies) and it is particularly satisfying from a funding policy perspective to see such a high proportion of small businesses involved (47% of the participating companies) and cooperating with research facilities and large corporations.

Not only that, but new participants are being constantly brought on board and new collaborations between Austrian companies are being initiated (83% of the participating companies) all the time. The evaluation of the programme also reveals that this is one of the programme's keys to success. For many companies, one of the main motivating factors for participating in the projects was the opportunity to find cooperation partners.

Not only is the programme securing and creating jobs but there is firm evidence to show that it is resulting in a high level of input additivity (i.e. the extent to which the research funding encourages further R&D investments to be made at the supported companies and organisations).

In addition to this, since 2013 Austria has managed to improve its international position in the studied areas of “vehicle technology”, “infrastructure technology”, “applications” and “users”.

From a technological perspective, substantial progress can be seen in all areas. On average, the degree of maturity of the technology within the implemented subprojects has increased by three degrees, taking the projects much closer to readiness for application. In turn, this is leading to innovations in products, services, business models and processes. The high innovation quality is evident from the fact that three quarters of the innovations are new to the national or international market and that 86% of them have already been placed or are due to be placed on the market.

The programme is clearly also extremely relevant to climate policy, where it is having an effect on multiple levels because of what it is designed to achieve: by reducing traffic, relocating traffic, introducing alternative drives and making use of renewable energy sources. In addition, the scenario calculations performed for the flagship projects reveal that it will be possible to make significant CO₂ savings if the project objectives are implemented as planned.

Pressing ahead – Improving Austria's ability to compete and giving it a stronger technological advantage

Recent years have been marked by rapid development. Within this context, Austrian companies have managed to improve their ability to

compete internationally in the area of electric mobility, not least because of the Electric Mobility Flagship Projects.

Nevertheless, a whole host of research questions will still need to be tackled over the coming years. New areas of interest are constantly being added alongside the classic ones of how to reduce costs or increase the range of vehicles. Examples include integrated energy, the fusion of autonomous driving and electric mobility and how to integrate these into multimodal mobility solutions, or the opening up of new application areas. Not only are these topics extremely exciting and rewarding from a research point of view but, within the context of an increasingly competitive international environment, location policy demands that they be properly addressed.

That is why the Climate and Energy Fund will continue to support electric mobility in the future. Taking into account the requirements of economic and climate policy as well as technological progress, it will offer tailored funding to support the further development of electric mobility in Austria and the directly associated imperatives of securing and creating jobs.

► PROGRAMME IS CLOSE TO THE BUSINESS WORLD

75% of the participants are companies; of these, 53% are SMEs.

► NETWORKING

83% of the companies were able to find new cooperation partners by participating in a flagship project.

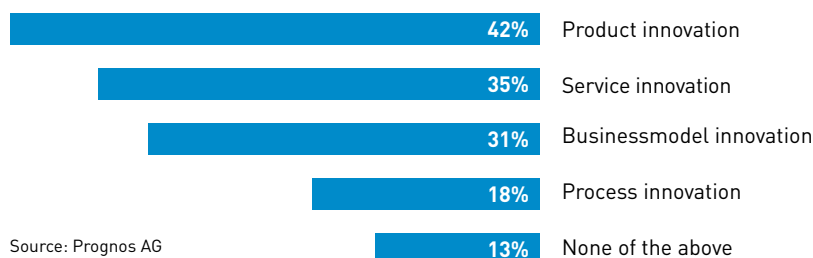
► SIGNIFICANCE OF THE SUPPORT

Without the support, none of the projects would have been fully realised and 42% would not have happened at all.

► NEW PRODUCTS AND BUSINESS MODELS

¾ of the developments are new to the national and international market.

Project results (multiple responses allowed)



Source: Prognos AG

Electric mobility is about much more than simply replacing the type of energy that powers the vehicles. In order for electric mobility to be rolled out on a grand scale, we will need brand-new infrastructure concepts. There are implications for the vehicles, the entire transport system and the energy infrastructure because, ultimately, electric cars are also active participants in the grid.

Over recent years, SIEMENS has undertaken a huge amount of research and has built up considerable know-how by participating in various ground-breaking flagship projects. Our broad technological portfolio encompasses solutions for every stage of the value-added chain: from technologies for automating and digitalising modern automotive production facilities, efficient electric engines and power electronics for vehicles, charging technologies and energy storage systems right through to the infrastructure that will be required for the grids of the future. Aside from the issues of technical development and market positioning, another important question that must undoubtedly be faced is how to leverage the situation for the purpose of protecting the climate. The only way that the climate will ever experience the full benefits of electric mobility is if the electricity we use to power our cars is generated from renewable sources. Thanks to technology from SIEMENS, the perfect conditions for achieving this are to be found in Austria.

WOLFGANG HESOUN

CEO of SIEMENS AG Austria

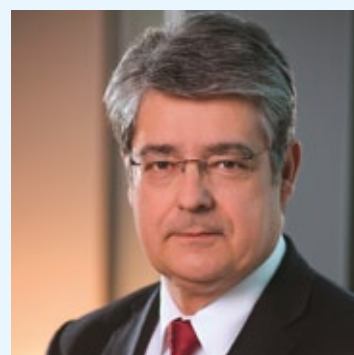
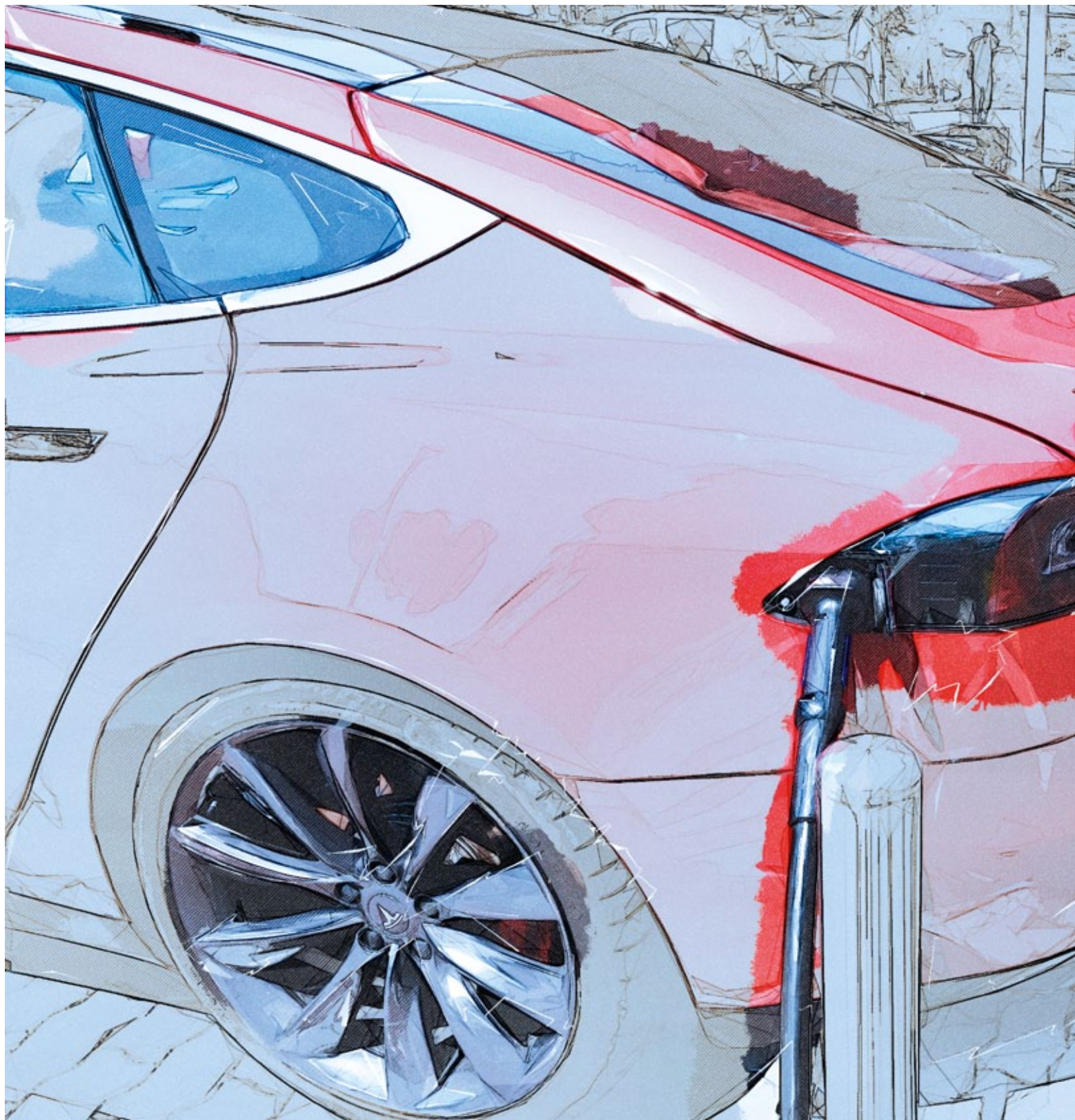


Photo: SIEMENS AG



EMPORA 1 & 2 / CROSSING BORDERS / VECEPT / eMPROVE /
EMILIA / LEEFF / E-LOG-BioFleet / RE²BA / ETA / EMPA-Trac /



ELECTRIC MOBILITY FLAGSHIP PROJECTS
SHOW THE WAY

RESEARCH AND DEVELOPMENT
FOR A MOBILITY SYSTEM
THAT IS FIT FOR THE FUTURE

eMORAIL / SMILE – simply mobile / SEAMLESS / CM0 /
CO₂ neutral ePort / MEGAWATT-LOGISTICS / FlyGrid

EMPORA 1 & 2

E-MOBILE POWER AUSTRIA

EMPORA is Austria's largest cooperative R&D project in the area of electric mobility. 22 leading firms from the automotive, power, infrastructure and research sectors have spent several years working on integrated technical and organisational solutions to facilitate the large-scale deployment of electric mobility across Austria. This extensive project is laying the foundations for reducing emissions and improving energy efficiency in the area of transport and is revealing how the energy turnaround in mobility can be achieved in concrete terms.

EMPORA

E-MOBILE POWER AUSTRIA

CONTACT

Eva Maria Plunger
 VERBUND AG
eva.plunger@verbund.com

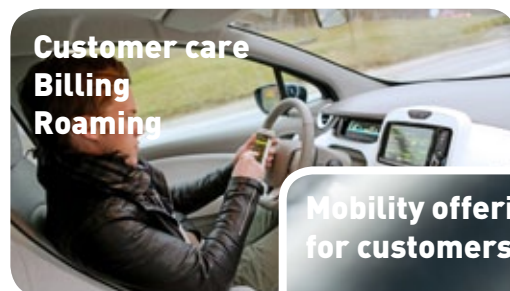
PROJECT PARTNERS

A1 Telekom Austria AG / AVL List GmbH / BEKO Engineering & Informatik AG / DiTest Fahrzeugdiagnose GmbH / EVN AG / Fluidtime Data Services GmbH / Ecotech / Infineon Technologies Austria AG / LINZ STROM GmbH / MAGNA E-Car Systems GmbH & Co OG / Österreichisches Forschungs- und Prüfzentrum Arsenal GmbH (AIT) / Raiffeisen Leasing GmbH / REWE International AG / Salzburg AG für Energie, Verkehr und Telekommunikation / Siemens AG Österreich / The Mobility House GmbH / UBIMET GmbH / VERBUND AG / Wien Energie GmbH / Wiener Linien GmbH & Co KG

The new forward-thinking concepts and solutions for electric mobility in Austria cover everything from the vehicle technology, the infrastructure and the integration of renewables right through to mobility offerings and services for end customers. Examples include powertrain/charging/storage components in the car itself, intelligent charging pillars that are able to communicate with both vehicles and users, smart grids, tools for energy-efficient routing and concepts for new business models.

The EMPORA 1 and 2 projects have unified the diverse approaches and brought together know-how from all the relevant economic sectors and research areas.

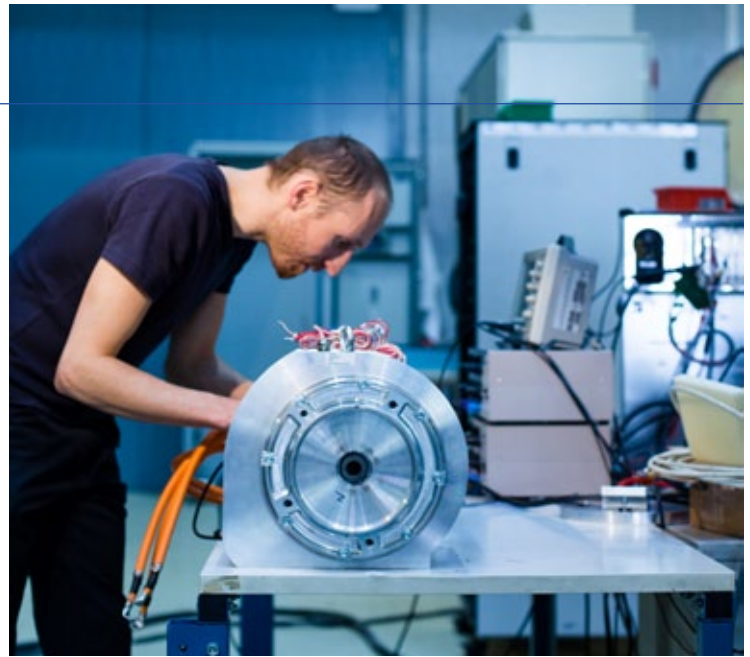
The new technologies and concepts are to be implemented within the context of a jointly developed system architecture. With this in mind, the first part of the project involved defining the roles, tasks and interfaces for the various players involved. The main requirement is to ensure that the needs of customers are met. The desire is to create incentives for using environmentally friendly electric vehicles by offering attractive and convenient solutions. EMPORA 2 focused mainly on infrastructure solutions, roaming concepts and how to embed electric mobility in multimodal mobility systems. All the results of the project were demonstrated in practice by allowing test users to try out the infrastructure technologies and service offerings in real-life situations.



All photos: Climate and Energy Fund / Astrid Bartl



Photo: VERBUND AG



AIT engine test bench, photo: Climate and Energy Fund / Astrid Bartl

High-tech solutions for electric vehicles

MAGNA E-Car Systems, AVL and Infineon developed new power train solutions as well as new vehicle charging and storage technologies with a view to making electric cars more suitable for everyday use and more cost-effective in the future. The components and software solutions were installed in a demonstration vehicle featuring a range extender (a two-cylinder piston engine) and with a total driving range of 400km (175km of which could be covered by the electric engine alone).

The researchers managed to optimise the electric power train and other EV system components in terms of their cost, weight, efficiency, safety and suitability for series production. The on-board AC/DC converter (charger) was similarly improved with regard to space requirements, weight and cost, and a highly efficient

modular system was developed for the 3.3kW to 10kW power range. As far as the batteries are concerned, new installation concepts were devised to enable better mechanical, electrical and thermal integration into the vehicle. This took account of how much storage space is normally provided in vehicles as standard and how much storage space customers want.

Smart infrastructure

In the area of infrastructure and energy (coordinated by SIEMENS AG Österreich, VERBUND AG and Wien Energie), concrete solutions were implemented for the charging infrastructure and energy supply. The infrastructure encompasses the hardware for charging the vehicle, management systems for the charging stations, data management in the grid, the provision of renewable energy and the software for supporting the customers. >>>



Photo: VERBUND AG

“EMPORA has set itself the goal of covering the entire e-mobility value-added chain and devising solutions accordingly: Getting partners from different sectors to cooperate has been the key to describing a complete system of electric mobility and using this as a basis for devising solutions that range from technological developments within the vehicle and the provision of energy from renewable sources right through to the testing of e-mobility services in conjunction with customers. This has clearly demonstrated that e-mobility can go a long way towards creating an ecologically sound transport sector.”

Eva Maria Plunger

Project Leader, EMPORA & CROSSING BORDERS
VERBUND AG

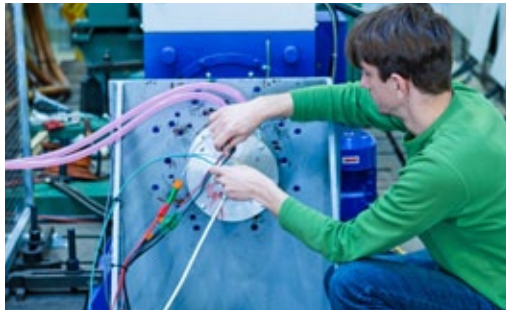


Photo: Climate and Energy Fund / Astrid Bartl

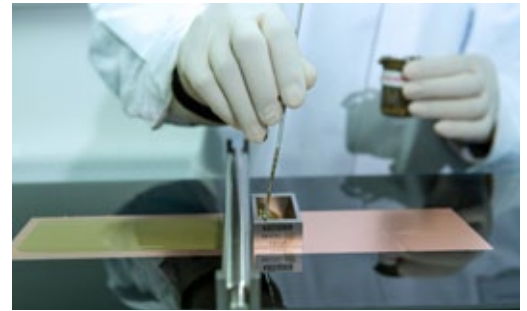


Photo: Climate and Energy Fund / Astrid Bartl

As part of the demonstration phase EMPORA charging stations were installed in Vienna and Graz. These were then accessed by the test users and have remained in operation ever since. With the launch of the follow-on project, which is called CROSSING BORDERS, the charging infrastructure has been expanded to cover the entire country. In 2014, VERBUND and SIEMENS (two of the partners involved in the EMPORA project) founded a company called SMATRICS to take care of the operational running of the charging infrastructure.

Electricity from renewable energy sources

One of the core elements of the project involved looking at how energy from renewable sources could be made available for electric mobility. An analysis was carried out on the basis of simulations to examine what requirements would be placed on the energy supply and grid infrastructure in the future, and a system was devised for supplying green electricity in a traceable and transparent manner. With a view to enabling a higher level of market penetration by electric mobility, a concept was drawn up for the integrated management and control of electric vehicles (e.g. as flexible consumers) in the event of fluctuations in the supply of energy from renewable sources (wind, solar).

Intelligent services for e-mobility

Given the limited range of electric vehicles, it is particularly important that they are integrated into the transport system as a whole. To this end, AIT and its partners came up with concrete offerings and support services, such as energy-dependent routing solutions. Dynamic routing takes account of how much energy would be consumed on the various routes and also the current availability of the charging points. It is even possible to integrate up-to-date traffic data and options for reserving charging stations. During EMPORA 2, the partners built on this by developing a form of multimodal routing (i.e. one that incorporates multiple modes of transport).

Demonstration phase involving test users

During the test phase, which lasted one year, 25 customers from Vienna, Graz and Salzburg tried out the new technologies and services in practice. An electric vehicle was leased to each customer and they were provided with a comprehensive mobility offering. The testers were free to choose between various models (passenger cars and vans) and drive technologies (battery electric and plug-in hybrid vehicles). The mobility package included the home charging infrastructure (wall box), a card for accessing the public charging infrastructure and additional services such as membership of an automobile association and special car sharing and car hire offers.



Photo: Climate and Energy Fund / Astrid Bartl

HIGHLIGHTS ▼

- R&D along the entire electric mobility value-added chain
- Joint system architecture developed
- Interfaces between the relevant players defined
- Capabilities of Austrian companies increased within the e-mobility segment
- Experience swapped with international R&D projects and initiatives



BENEFITS ▼

- Complete system of electric mobility analysed and described in terms of roles and functions
- Renewable energy for electric mobility assured
- Hardware, management/CRM systems for charging infrastructure developed and tested with customers
- Vehicle developments presented and tested using demonstrator EV
- Electric mobility-specific routing solutions developed and tested
- Stakeholders regularly informed of project results and linked via a network

Photo: VERBUND AG

Follow-on projects

The results of the EMPORA project are serving as a basis for the CROSSING BORDERS flagship project and the international CEGC (Central European Green Corridors) project, which was funded by the Trans-European transport networks (TEN-T).

Within this context, VERBUND has worked with its international partners at a European level to implement a cross-border network of rapid charging stations along with cross-border roaming services (see page 28).

“The EMPORA project involved partners from all along the value-added chain. This made it possible to obtain feedback on new components for the innovative area of electric mobility at an early stage and, in turn, this led to better decisions in relation to further development work. The results from EMPORA have helped to transform semiconductor switches for BEVs and PHEVs into a major area of business for Infineon.”

Herbert Pairitsch

INFINEON TECHNOLOGIES AUSTRIA AG
EMPORA Project Partner



Photo: VERBUND AG



LINK

www.empora.eu



Project videos

<https://youtu.be/MC4Xk8Eihpk>

und <https://youtu.be/XxysF8kW2os>

CROSSING BORDERS

CROSS-BORDER E-MOBILITY SERVICES

Through the CROSSING BORDERS project, VERBUND and its partners from Germany, Austria and Slovakia are achieving new milestones to enable the rapid implementation of electric mobility. 30 rapid charging stations in the regional western corridor running through the three participating countries, intelligent access and billing systems, and an intermodal routing concept are opening up convenient and energy-efficient electric mobility solutions that can be accessed across national borders.



CROSSING BORDERS

CONTACT

Eva Maria Plunger
VERBUND Solutions GmbH
eva.plunger@verbund.com

PROJECT PARTNERS

AIT Austrian Institute of Technology GmbH / E.ON Technologies GmbH / SMATRICS GmbH & Co KG / Ecotech e.U. / Fluidtime Data Services GmbH / IFSTTAR/ENTPE / OVOS Media GmbH / Siemens CVC Convergence Creators GmbH / PDTS GmbH / Ubimet GmbH / VERBUND Solutions GmbH / TRAFFIX / ZSE Západo slovenská energetika

CROSSING BORDERS connects the four e-mobility regions of Bratislava, Vienna, Salzburg and Munich. To this end, a transnational e-mobility corridor has been developed and the entire infrastructure has been set up all the way along it. 13 companies are participating in this process of creating an international and interoperable electric mobility network.

The establishment of the rapid charging corridor is based on a network plan that was itself developed as part of the CROSSING BORDERS project. This plan was drawn up using a mixture of socio-economic and transport planning input data. In this way, it is possible to identify the ideal locations for users. The assumptions made by the project in relation to location attractiveness are analysed using an internally developed work package.

SMATRICS (a company founded by the EMPORA partners VERBUND and SIEMENS) is responsible for the operational running of the charging infrastructure.

Customer convenience is a stated aim of all the project partners involved. The rapid charging stations along the route are connected to an intelligent cross-border roaming and billing system. This means that users can use a variety of providers to charge up their vehicles without any problem. In addition, an intermodal route planner is being developed for use in all three countries, thereby providing different mobility offerings for the regions concerned. On the basis of this information, customers will be able to select exactly the right set of environmentally friendly mobility services at each point of the route.

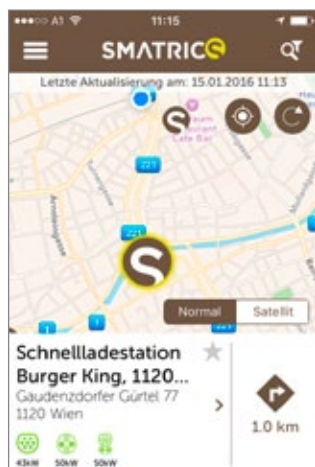


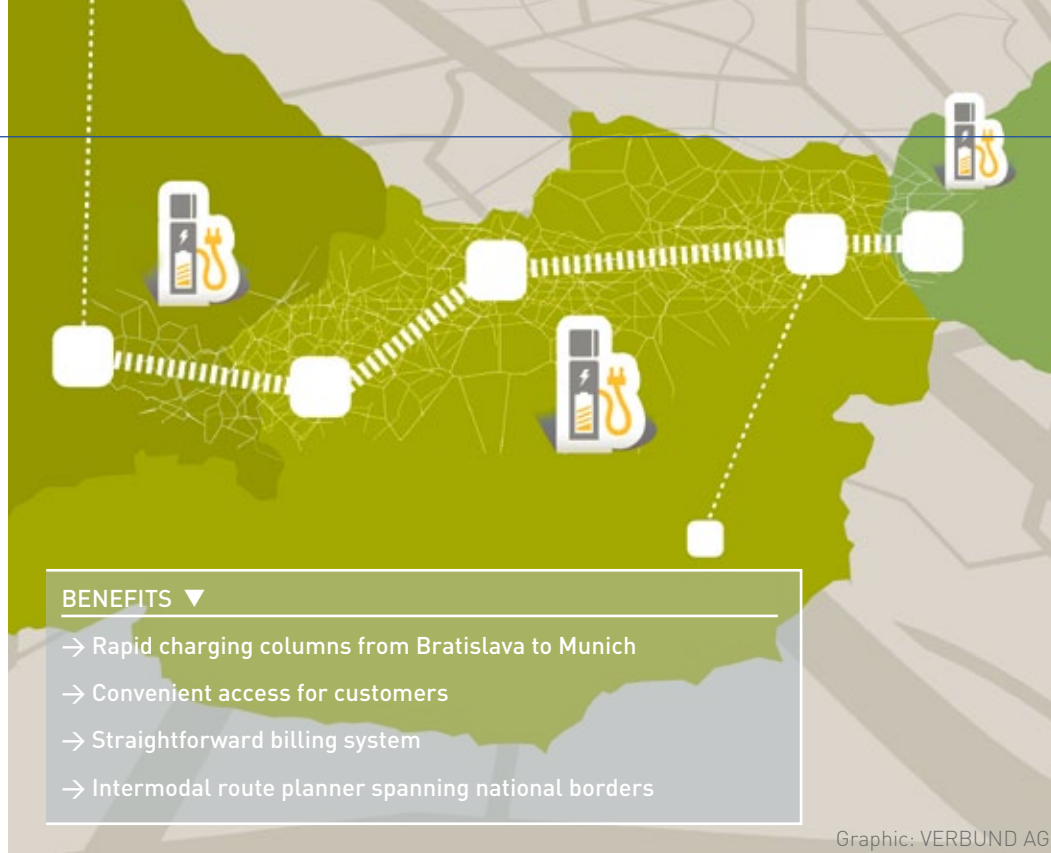
Photo: VERBUND AG

HIGHLIGHTS ▼

- Implementation of intelligent, cross-border systems for electric mobility
- Creation of an e-mobility corridor along the axis formed by Slovakia / Austria / Germany
- Transnational roaming and billing systems
- Chance for Austrian companies and research partners to cooperate in international follow-on projects



www.crossingborders.cc/de/projekt



BENEFITS ▼

- Rapid charging columns from Bratislava to Munich
- Convenient access for customers
- Straightforward billing system
- Intermodal route planner spanning national borders

Graphic: VERBUND AG

International network

Following on from the CROSSING BORDERS project, Austrian companies and research facilities were involved in the international CEGC (Central European Green Corridors) project, which has been funded by the Trans-European transport networks (TEN-T). The aim of this cooperation was to create a pan-European e-mobility network and establish transnational infrastructures.

The EMPORA and CROSSING BORDERS flagship projects have put Austrian know-how on the map internationally. At a European level, Austria collaborated with BMW, Nissan, Renault and Volkswagen within the context of the CEGC project.



Photo: ZSE

“Thanks to the roaming concept that has been developed and implemented as part of the CROSSING BORDERS project, it is now really easy for drivers of electric vehicles to cross the border into Slovakia and charge up their vehicles at ZSE charging stations. An example is the rapid charging station at ‘Bory Mall’ close to the Slovakian/Austrian border. As roaming partners, ZSE and SMATRICS manage the transaction in the background without bothering the customers.”

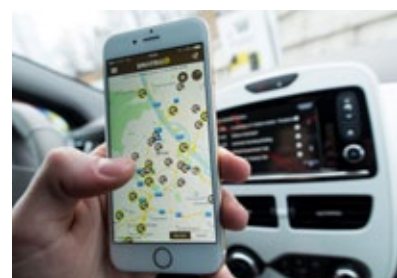
Radoslav Markus

ZSE Západo slovenská energetika
CROSSING BORDERS Project Partner



Project video

https://youtu.be/VfAVIE_PxoA



Photos 1, 2, 4, 5: Climate and Energy Fund / Astrid Bartl
Photo 3: VERBUND AG

VECEPT

VEHICLE WITH COST-EFFICIENT POWERTRAIN

The VECEPT flagship project is concerned with the development and testing of a cost-effective plug-in hybrid vehicle (PHEV) that is suitable for everyday use. This is to take the form of a volume model for the global market with an electric range of approximately 50km. Key factors for achieving the objectives are the development of a comprehensive thermal and energy management system and a battery that is optimised from both a weight and energy perspective. In addition, a professional management tool for mixed vehicle fleets is being developed and the project is looking into the behaviour of various user groups in relation to the charging infrastructure.



CONTACT

Theodor Sams
AVL List GmbH
theodor.sams@avl.com

PROJECT PARTNERS

AVL List GmbH / AIT Austrian Institute of Technology GmbH / ecoplus. Niederösterreichs Wirtschaftsgesellschaft GmbH / Fluidtime Data Services GmbH / IESTA – Institute for Advanced Energy Systems & Transport Applications / Infineon Technologies AG / IVD Prof. Hohenberg GmbH / MAGNA E-Car Systems GmbH & Co OG / University of Vienna / Samariterbund Wien Rettung und Soziale Dienste gemeinnützige GmbH / VERBUND AG / VIF – Kompetenzzentrum Das virtuelle Fahrzeug Forschungsgesellschaft mbH (Graz)

The VECEPT solutions

> Virtual vehicle manufacturer (OEM): Given that there is no relevant OEM in Austria, the members of the consortium created a virtual OEM for VECEPT (that could also be used beyond the confines of the project) that had all the competencies and expertise required to produce a complete vehicle.

> Management of mixed fleets so that a large pool of users can be built up quickly: VECEPT concentrates on the use of PHEVs (Plug-in-Hybrid Electric Vehicles) and BEVs (Battery Electric Vehicles) within larger conventional fleets with the aim of encouraging the roll-out of electric mobility, providing fleet operators with security and flexibility, and overcoming anxieties about the driving range. Further down the line, it will become possible to target private users as well.

> Powerful and easy-to-use infrastructure for PHEVs and BEVs: The charging infrastructure has a key role to play in the use of electric mobility, for example, as a means of reducing anxieties about the driving range. As well as considering the issue of installation, VECEPT is also analysing possible differences between the requirements of various user groups in relation to PHEVs and BEVs and working out how to balance these. This is the first ever study of its kind. Ultimately, the aim is to make users feel just as “at home” with the new technology as they do with conventional fuelling solutions.

Fully developed and tested PHEV demonstration vehicle with cost-effective power train

As far as the demonstrator vehicle was concerned, the top priorities were efficiency, weight, performance, comfort, range and cost, i.e. all the parameters required to boost consumer acceptance of the innovative vehicle concepts. These key criteria were used as a basis for drawing up an innovative concept for the passenger car power train. New components were developed and optimised on test benches and in test vehicles with a view to achieving the power, torque, fuel consumption, emission and noise behaviour targets.

On the basis of these tests, the VECEPT plug-in hybrid vehicle was then built using a volume model as a platform. This made it possible to carry out intensive tests on the new components within the vehicle in order to optimise the system and power train configurations of the BEVs/PHEVs. In addition, the thermal management system of the vehicle and the HVAC (heating, ventilation and air conditioning) system were optimised to achieve the maximum possible efficiency while still keeping the costs reasonable. >>>



Photo: Climate and Energy Fund / Astrid Bartl



Photo: Climate and Energy Fund / Astrid Bartl

Photos on left: AVL List GmbH



Photo: Climate and Energy Fund / Astrid Bartl

“The development and rapid market launch of cost-effective plug-in hybrid vehicles have a major role to play in reducing CO₂ emissions. In contrast to purely electric vehicles, these vehicles are also the key to overcoming the anxieties that users have about the driving range and can have a wide-reaching impact – not least on the environment.”

Theodor Sams

Project Leader, VECEPT
AVL List GmbH



In 2017, not only was the demo vehicle presented to customers worldwide but it was also exhibited at the most important motor and vehicle conventions (such as The International Vienna Motor Symposium). The integrated systems are now being improved so that the vehicle is ready for release as a prototype and can be used for further demonstration and benchmarking activities.

The VECEPT battery – High energy density and lower costs

Samsung SDI Battery Systems GmbH (formerly: Magna Steyr Battery Systems GmbH & Co OG) were responsible for developing the battery system, which they had to optimise from an energy and cost perspective while also taking reduced CO₂ emissions and safety into account.

The aims were primarily achieved by using an alternative cell technology within the prototype battery on the plug-in hybrid vehicle (PHEV). This offers better capacity values and lower internal resistance without having to increase the size. Consequently, the performance of the PHEV battery has been improved and less heat is generated during charging/discharging. In turn, this improves the life of the temperature-sensitive cells.

The overall result is a higher energy density coupled with a lower weight. Both of these characteristics have a positive impact on the electric range of the vehicles. Compared with a conventional battery, the prototype battery has managed to extend the electric range by more than 20% with a corresponding reduction in carbon dioxide emissions. What's more, by introducing new lighter-weight concepts and reducing the battery components, the manufacturing process can also be optimised.

Strategic planning software framework for managing mixed fleets

With the new fleet management tool that has been developed, optimised strategies can be drawn up for gradually introducing PHEVs and BEVs into existing (conventional) vehicle fleets. This tool uses the basic data for the existing vehicle fleet and the daily mobility requirements of users to generate solutions that are optimised from the perspective of costs and CO₂ emissions.



HIGHLIGHTS ▼

- New power train: Highly integrated approach (combustion engine/electric engine/gearbox/operating system) minimises ineffective operation of the combustion engine
- New battery concept: Higher energy density coupled with lower costs
- New software tool for fleet management: Optimises strategies for gradually introducing PHEVs and BEVs
- New infrastructure: Expansion of rapid charging stations in the Vienna – Graz corridor



BENEFITS ▼

- Development of cost-effective solutions that are suitable for everyday use
- Broad base of users (business, private and public)
- Users made to feel just as “at home” with the charging technology as they do with conventional fuelling solutions
- Potential to overcome anxieties about driving range
- Security and flexibility for fleet operators
- Further encourages the roll-out of electric mobility

Photo: Climate and Energy Fund / Astrid Bartl

A variety of scenarios can be run to simulate future developments such as demand and energy/fuel costs etc. as well as what effect the number of charging stations will have. In this way, the requirements for the charging infrastructure can be determined.

This optimisation calculation results in a suggested mix of conventional, electric and plug-in hybrid vehicles for the fleet. Detailed vehicle purchase and sale decisions are outlined for each solution within a specific time frame.

Infrastructure

Four rapid charging stations have been set up between Vienna and Graz (Dobl-Kaiserwald service station, Wiener Neustadt, Schottwien service station, Sebersdorf service station). The associated trials are now complete and day-to-day charging data is being collected for the purpose of scrutinising and evaluating user behaviour patterns.



Project video
https://youtu.be/e7kehsek_s0

eMPROVE

INNOVATIVE SOLUTIONS FOR THE INDUSTRIALISATION OF ELECTRIFIED VEHICLES

The aim of the eMPROVE flagship project, which was launched in October 2015 and is due to run until 2018, is to industrialise the innovative components and electrified vehicle concepts that have been developed as part of the VECEPT flagship project. Another major focus of the project is to further improve energy and cost efficiency while paying particular attention to the possibilities of future mass production on an industrial scale.



CONTACT

Michael Nöst
 IESTA – Institute for Advanced
 Energy Systems & Transport
 Applications
 office@iesta.at

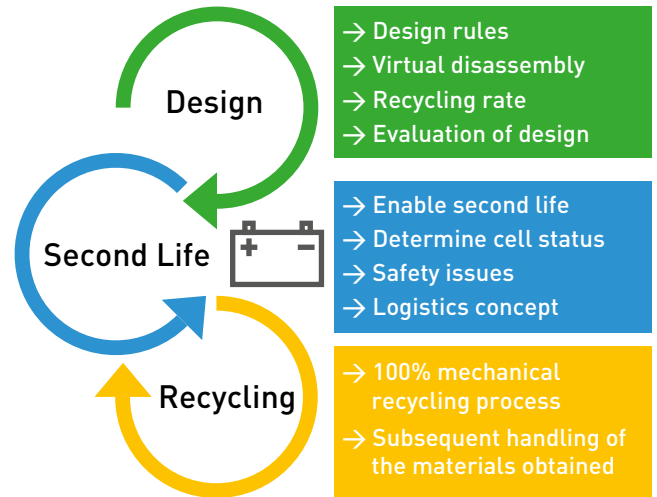
PROJECT PARTNERS

AVL List GmbH / AIT Austrian
 Institute of Technology GmbH /
 ATT advanced thermal technolo-
 gies GmbH / 4a manufacturing
 GmbH / IESTA – Institute for
 Advanced Energy Systems
 & Transport Applications /
 Leichtmetallkompetenzzentrum
 Ranshofen GmbH / Montan-
 universität Leoben (University
 of Leoben) / REDUX Recycling
 GmbH / Samsung SDI Battery
 Systems GmbH / Saubermacher
 Dienstleistungs AG / VIF – Kom-
 petenzzentrum Das virtuelle
 Fahrzeug Forschungsgesell-
 schaft mbH (Styria) / Zoerkler
 Gears GmbH & Co KG

- CO₂ reductions
- Cost reductions/Efficiency
- User friendliness, safety and convenience
- Maximum added value for the Austrian economy
- High level of international visibility

The eMPROVE project involves analysing, improving and evaluating electric vehicle gearboxes, the combustion engine, and storage and energy systems from the perspective of industrialisation. These activities are supplemented by the following: innovative approaches (cross-system methods, processes and materials for energy systems plus intelligent control concepts for energy systems and gearboxes), the improvement of existing series-produced technology (battery analytics and modularisation, heating and cooling of the storage and energy systems) and the related system development work to enable subsequent integration into the vehicle.

In future, the issue of how to manufacture electrified vehicles cost-effectively will be addressed by designing flexible PHEV drive systems and modular HV battery systems that are easier to integrate into more vehicle classes. Recycled and second-life electrochemical storage systems are opening up new possibilities in terms of costs and cost-cutting measures in the area of series production and beyond.



As a result, product design and near-series production of electric vehicles may undergo substantial changes, leading to expanded business models, business scenarios and lower prices for end customers. In addition, there are likely to be clear benefits for the environment.

Initial development results from the eMPROVE project show that existing vehicle, energy storage system and recycling technologies still offer potential for innovations and optimisation. The development results are currently being integrated into prototypes and are undergoing functional validation. During the final project phase, standardised test procedures on demonstrators who are close to the market will be carried out to evaluate the potential for improvements in energy efficiency, cost efficiency and mass-producibility. So the next generation of vehicle, battery and recycling technology will be ready for the planned market launch date of 2019/2020.



All photos: Climate and Energy Fund / Astrid Bartl



BENEFITS ▼

- Innovative solutions for the industrialisation of electrified vehicles
- Longer range for electrically powered vehicles
- Cheaper and innovative components for lower vehicle prices
- Reduced impact on the environment – less energy consumed over the entire life cycle and optimum use of resources
- Novel recycling/second life approaches for electrochemical storage systems

HIGHLIGHTS ▼

- Recycling of environmentally critical components
- Design of an intelligent concept for the battery housing
- Information for reusing batteries/giving batteries a second life
- Demo models for a PHEV vehicle and for a modular battery system



Photo: Virtual Vehicle / W. Wachmann

“A more cost-effective method of manufacturing electrified vehicles will be ensured in the future by designing PHEV drive systems and modular HV battery systems that are flexible. In the future, these measures will enable the components to be integrated more easily into a larger number of vehicle classes and will ensure cost-effective recyclability and second life use.”

Michael Nöst

Project Leader, eMPROVE

IESTA – Institute for Advanced Energy Systems & Transport Applications



LINK

www.eMPROVE.at

eMORAIL

INTEGRATED EMOBILITY SERVICE FOR PUBLIC TRANSPORT

The thought of having to walk the “first and last mile” from the station to your final destination and then back again often acts as a psychological barrier to using public transport. eMORAIL is a forward-thinking, environmentally friendly and cost-effective mobility service for commuters that systematically links up public transport and electric mobility solutions. This intelligent complete concept has already been successfully piloted by test users from rural regions (Bucklige Welt in Lower Austria and Leibnitz in Styria) over a period of 16 months. The next step is to develop it further and get it ready for deployment across the whole of Austria.



CONTACT

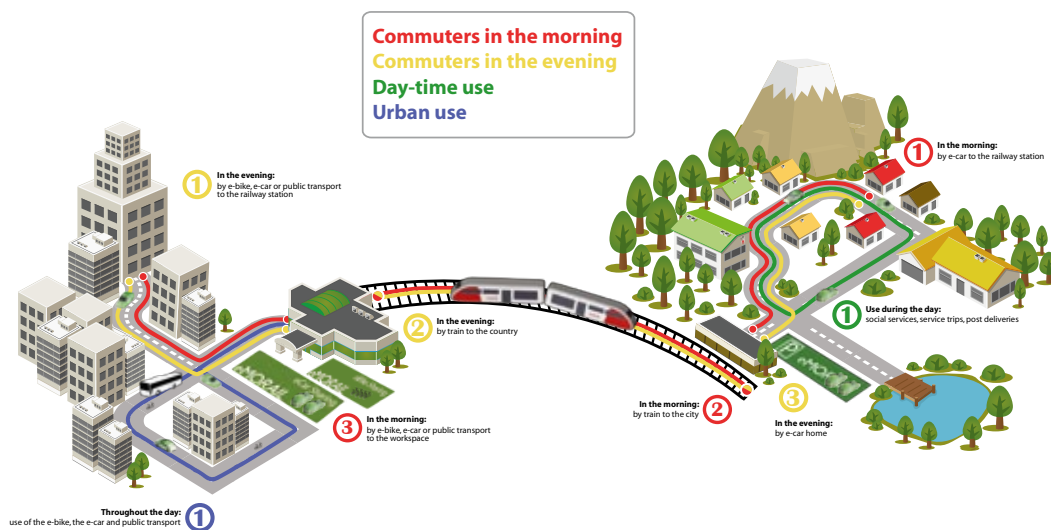
tbw research GesmbH
Angelika Rauch
eMORAIL@tbwresearch.org

ÖBB-Personenverkehr AG
Helmut Wolf
helmut.wolf@pv.oebb.at

Quintessenz Organisations-
beratung GmbH
Walter Slupetzky
w.slupetzky@quintessenz.or.at

PROJECT PARTNERS

tbw research GesmbH /
create – mediadesign GmbH /
Quintessenz Organisationsbera-
tung GmbH / HERRY Consult
GmbH / P.L.O.T. EDV-Planungs-
und Handelsgesellschaft mbH
/ iC consulenten Ziviltechniker
GmbH / DB Rent GmbH /
EBE Mobility & Green Energy
GmbH / NTT DATA Österreich
GmbH / Rail Equipment GmbH /
ÖBB-Personenverkehr Aktien-
gesellschaft / Verkehrsverbund
Ost-Region (VOR) GmbH



Picture: create – mediadesign GmbH

To build a solid network of electric vehicles as one component of environmentally friendly, intermodal mobility offerings – this is the idea behind eMORAIL, an innovative service concept that has been developed and trialled by the Austrian Federal Railways (ÖBB) in cooperation with ten partner companies. The eMORAIL sharing package for commuters combines an ÖBB rail ticket with the use of an electric vehicle for the journey from home to the station. Once commuters arrive at their destination station (Vienna or Graz), they can continue their journey to work by bus or underground/overground train, or by borrowing a car sharing vehicle. The service package includes a travel card for the public transport network at the

destination and access to an e-car sharing service provided by EMIL and Flinkster (since 2017 ÖBB Rail & Drive). When commuters arrive at their home station, the eMORAIL car is already there waiting for them: fully charged, clean and ready for use.

The complete charging management system was developed as part of the project and charging stations were set up at the railway stations and at the homes of the test users. The project had its very own photovoltaic power plant, which generated the same amount of energy as consumed by the electric cars. To maximise utilisation, the electric cars were used for commercial purposes during the day by business



Photo: create – mediadesign GmbH



Photo: create – mediadesign GmbH

users such as the postal service and local firms. Outside of business hours, the vehicles were available to the users for personal journeys. All services were planned and controlled using the eMORAIL smartphone app. This could be used to access information about availability,



Photo: create – mediadesign GmbH

the current battery status and range of the electric car, real-time timetable information, vehicle reservations, and so on. Users paid a monthly all-inclusive mobility fee that covered the commuter ticket, the use of the electric vehicle and all the other services. >>>



Photo: Climate and Energy Fund / Astrid Bartl



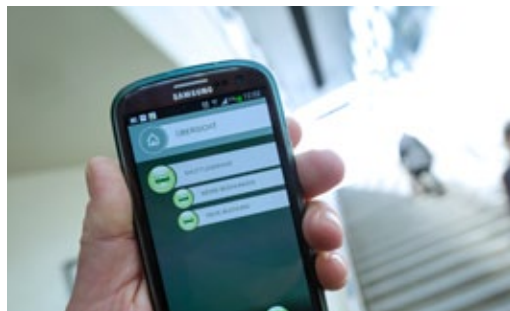
**JASMIN THOMANN
FROM EVERTO,
A PHOTOVOLTAICS COMPANY
BASED IN LEIBNITZ AND AN
eMORAIL BUSINESS USER**

"As daily users, we rely on the vehicle for lots of different things. It allows us to travel to our installation sites and fetch materials, and we cover an average distance of around 50km a day. The vehicle has a long range and so does the job perfectly without having to be charged up partway through. It has really proven its worth with commuters, who are able to use the car outside of work. Communication is very good. In other words, we can find out about any scheduling changes by telephone – but by and large, everything runs according to the agreed schedule."



HIGHLIGHTS ▼

- Intelligent linking of public transport and electric vehicles
- Design and technical development of an integrated e-mobility solution
- Development and implementation of the eMORAIL smartphone app
- Design of an open, interoperable charging management system and a charging station
- Structural measures at the sites (including photovoltaic power plants, charging facilities at the homes of commuters)
- Successful implementation of test phase
- Public transport improved in rural areas by offering new supplementary mobility services



Photos right and below: Climate and Energy Fund / Astrid Bartl



**JOHANN HOFMANN,
FROM LEIBNITZ,
AN eMORAIL SHUTTLE USER**

"I am extremely happy with the eMORAIL shuttle service, although I only use it weekly – not every day. The process of booking with the system and with the partner company works perfectly and I am always picked up punctually. I am a huge fan of electric mobility. It would still be too expensive for me to get a vehicle of my own, but I like the combination of the shuttle service plus train, which caters for the general public very well."

eMORAIL ADVANCED – NEW SERVICES FOR ENVIRONMENTALLY SOUND MOBILITY

eMORAIL advanced focused on rolling out the scheme across the whole of Austria and enhancing the concept. Firstly, it was a question of improving the technology even further (e.g. the functionality for accessing the vehicle via a smartphone or for automated billing and settlement). Secondly, attempts were made to increase the pool of potential users significantly. To this end, mobility experts, regional stakeholders and corporate partners worked out new solutions so that environmentally friendly mobility services for the onward journey can be integrated into the public transport system, e.g. shuttle services, synchronised pick-up times or the offer of a lift to ensure multiple occupancy of the electric vehicles.

Among other things, a test was carried out to see how feasible it would be to use eMORAIL vehicles as a passenger and to book a lift using the smartphone app as and when required. Thus, the offer was also geared towards people who work part-time or who do not have a driving licence. In addition, an e-shuttle service concept has been developed to provide commuters with a local transport option for getting between home and the station. This is fully synchronised with the train arrival and departure times.

As part of the project, Austria's first ever electric vehicle shuttle service underwent testing in Leibnitz (Styria). An individual and affordable mobility service based on the eMORAIL model has been running successfully in the municipality of Leibnitz since the end of 2015. This service, which is called "LeibnitzMOBIL", is to be extended to other municipalities in the future.

The electrically powered vehicle for the project was the result of a collaboration between ÖBB and Graz (a model region of electric mobility) and links the various districts – even travelling to areas not covered by public transport. It takes commuters to the railway station and is also available for personal journeys during the day (so that people can go shopping, get to the doctor's or get to appointments with the authorities). There are more than 40 collection points within the municipal area. You can board the shuttle at any of these at your chosen travel time and then get dropped off at another one. Routes are tailored in accordance with when people want to travel. The fare charged is similar to the cost of public transport.

Further information:

www.leibnitz.at/buergerservice/leibnitzmobil/

BENEFITS ▼

- Smart e-mobility solution for commuters in rural regions
- Flexible mobility that relies on the use of an electric car and public transport as an alternative to owning your own car
- Intelligent service package from a single source
- Smartphone app offers a convenient booking and control method
- Regionally tailored shuttle and car sharing models

Photo: Climate and Energy Fund / Astrid Bartl



Another new development is the pooling tool for business customers. This module allows employees who work for the same company to travel the final mile between the station and their place of work by sharing an electric car. This reduces costs. The concept even allows for vehicles from the pool to be used across different companies.

Another new idea for a service was the eMORAIL station storage box, which was aimed at

eMORAIL commuters who do not drive. The associated app allowed them to order goods from local retailers (e.g. groceries) and have them delivered to their storage box in the course of the day so that they were ready to collect on the way home from work. A prototype has been developed as part of the eMORAIL advanced research project. This meets all the technical requirements and is ready to be implemented in cooperation with local suppliers.



Photo: private

“As a result of the growing trend towards electric mobility, new aspects of contemporary mobility solutions are emerging. The ‘eMORAIL’ intermodal mobility concept of the Austrian Federal Railways made it possible to integrate a car sharing model in a sensible way so that it becomes a well-networked component of one overall transport concept. As part of the research project, commuter models (such as the local shuttle and lift services or collection points for day-to-day purchases) were being trialled so that they could be rolled out to locations across all the federal provinces in the future. The aim here was to make the journey to work as easy as possible for commuters by providing them with an optimum service offering that provides a cost-effective solution.”

Helmut Wolf

Project Leader, eMORAIL
ÖBB-Personenverkehr



Project videos

<https://youtu.be/gtjsfdCTKhc>
und <https://youtu.be/fXZxmvjQ7Xo>

SMILE – simply mobile

SMART MOBILITY INFO & TICKETING SYSTEM

In the future, the way we get around is going to change fundamentally, particularly in the main conurbations. Integrated mobility concepts are counting on a change in the way we choose and combine private and public modes of transport, with our decisions becoming more needs-based, varied and spontaneous. The SMILE flagship project involved developing a prototype for a multimodal mobility platform for use all across Austria. SMILE links public transport (PT) with electric mobility and brings together different elements in one unified system, namely information, booking and payment processes, and the benefits of various transport types.

smi)e einfach mobil

CONTACT

Reinhard Birke
Wiener Stadtwerke Holding AG
reinhard.birke@wienerstadtwerke.at

PROJECT PARTNERS

Wiener Stadtwerke Holding AG /
Wiener Linien GmbH & Co KG /
Wien Energie Stromnetz GmbH/
WienIT EDV Dienstleistungs-
gesellschaft mbH & Co KG /
ÖBB-Holding AG / ÖBB-Infra-
struktur AG / ÖBB-Personen-
verkehr AG / iC consulanten
Ziviltechniker GmbH / Fluidtime
Data Services GmbH / NTT
DATA Österreich GmbH / cre-
ate – mediadesign GmbH /
Vienna University of Technology
– Research Center of Transport
Planning and Traffic Engineering
/ Quintessenz Organisations-
beratung GmbH / tbw research /
ETA Umweltmanagement / Neue
Urbane Mobilität Wien GmbH

ÖBB and Wiener Linien, the two biggest mobility providers, joined forces with numerous partner companies to develop the smart mobility solution. The SMILE mobility platform integrates all kinds of transport types (conventional public transport as well as e-car sharing, e-bikes, hire cars, rental bikes, taxis etc.) and combines them with routing information and user data to create tailored mobility offerings.

The SMILE app can be installed on a smartphone and lets users know what travel options are available for getting from A to B. Combined journey suggestions are created from the individual services on offer. Customers can select the route and mode of transport, book their journeys and obtain a ticket to cover all the mobility services they have selected. They can also pay for these in a single step.

Key technology for integrated mobility

A standard interface (SMILE Connector) allows the various mobility providers to connect their technical systems via specific adaptors and to

make all relevant data available in real time. Even ticket sales can be completed via the system. The same principle is used to connect routing services to the mobility platform: the Austrian transport information service, the AIT router that has been specifically developed for electric cars and e-bikes, and the toursprung routing engine for bikes.

All the data goes to the application server of the mobility platform, where the relevant data items are selected and combined on the basis of the user request. These are then used to produce the individually applicable journey suggestions along with the associated price information. Customers can book and pay for all the services directly without having to switch to the respective systems of the providers. Clearing with the payment service provider runs in the background.

The SMILE pilot phase

In order to test the SMILE platform, a multi-stage practical trial was carried out over the

HIGHLIGHTS ▼

- Key technology for integrated mobility
- Easy-to-use open-access mobility platform
- System designed from the perspective of the user
- Standard guidance and integrated control system despite it being an open system
- Connection of hardware and infrastructure (e.g. charging stations, vehicles, car parks)



Project video

<https://youtu.be/ZWTZOS-d1DM>



LINKS

www.smile-einfachmobil.at

BENEFITS ▼

- SMILE offers tailored mobility solutions from a single source
- Smart linking of different modes of transport (public transport, e-bikes, e-car sharing, rental bikes, hire cars, taxis)
- User-friendly smartphone app
- Intelligent information, route planning, electronic booking and payment in one unified system

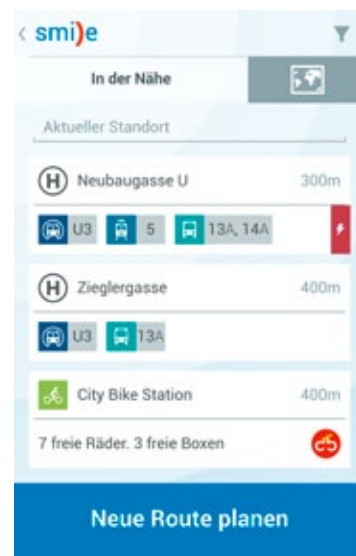


course of one year with more than 1000 participants. 6% of those surveyed said they used the SMILE app every day during the pilot phase, with another 30% using it several times a week. They primarily used the services for running personal errands (64%), leisure trips (59%) and for accessing routes not covered by the usual transport companies (45%).

When the pilot phase was evaluated, the results revealed that the mobility platform can be used to increase the use of sharing and electric mobility services while reducing the number of journeys made by private car. A total of 48% of the SMILE testers surveyed said that they had started using public transport more often. 10% were accessing bike sharing schemes more often and 4% were making more frequent use of e-car sharing services. Another 4% were using their e-bike/pedelec more often. 21% of the pilot users surveyed said they were using their private car less frequently.

More than two thirds of those surveyed admitted to trying out new ways of getting from A to B thanks to the routes suggested by SMILE. In most cases, this consisted of using alternative means of transport (47%) or different combinations of transport (24%). This demonstrates that smart mobility solutions can play a significant role in helping people to break established patterns of mobility behaviour and try out alternatives.

The project partners have taken the results from the SMILE flagship project and are now developing them on a variety of levels. With a view to implementing and operating the highly successful multimodal “Wegfinder” route planner app, ÖBB Holding has set up a special subsidiary called iMobility. Meanwhile, Wiener Linien and Wiener Stadtwerke are operating an open multimodal platform solution via their subsidiary “Upstream – next level mobility”. This allows them to offer multimodal route planning to customers through their “Wien Mobil” app.



Photos:
Wiener Stadtwerke Holding AG



Photo: Wiener Stadtwerke
Holding AG

“To enable the use of electric mobility across the board, it is essential to have efficient access to information about charging station, e-mobility routing, range/journey time, state of charge etc. as well as opportunities for using it (e-car sharing, reservation of charging stations, activation of charging process, and so on). The SMILE research project was the first time that all this had been trialled by incorporating it into the public transport system as a whole. In the course of the project, it became clear that – in spite of numerous technical obstacles – the offering enjoyed a high level of acceptance among those users who were already committed to electric mobility. The project helped to highlight current user hurdles, to confirm that it does make sense to incorporate everything into one comprehensive mobility offering and to pave the way for further implementation projects within this area.”

Reinhard Birke

Project Leader, SMILE
Neue Urbane Mobilität Wien GmbH

SEAMLESS

SUSTAINABLE, EFFICIENT AUSTRIAN MOBILITY WITH LOW-EMISSION SHARED SYSTEMS

Electric mobility is rarely used in commercial environments, because company vehicles usually have to satisfy lots of different requirements. Company cars are used for long journeys as well as shorter ones, they are generally assigned to individuals and they are available for business and personal journeys alike. In May 2016 the SEAMLESS flagship project was launched, which focuses on innovative concepts for business e-fleets. The aim is for new technologies and mobility solutions in the areas of car sharing and car pooling to make the commercial use of electric vehicles more attractive.

CONTACT

Matthias Prandtstetter
AIT Austrian Institute of
Technology GmbH
matthias.prandtstetter@ait.ac.at

PROJECT PARTNERS

AIT Austrian Institute of Technology (lead) / Österreichische Post AG / HERRY Consult GmbH / tbw research GesmbH / SPECTRA TODAY GmbH / im-plan-tat Raumplanungs GmbH & Co KG / iC consulenten Ziviltechniker GesmbH / ETA Umweltmanagement GmbH / T-Systems Austria GesmbH / ENIO GmbH / Fronius International GmbH / Kalomiris Consulting e.U. / ecoplus. Niederösterreichs Wirtschaftsagentur GmbH / Greenride GmbH / creative-it Software & Consulting e.U.

The forms of financial relief for electric cars that have taken effect following the 2016 tax reform (company vehicles no longer classed as benefits in kind, input tax deduction) are an opportunity to establish electric mobility more firmly within the commercial environment. Innovative mobility concepts plus new business and operator models are required so that companies are able to switch their fleets over to electrically powered vehicles.

Under the leadership of the AIT (Austrian Institute of Technology), project partners from a large number of Austrian companies are in the process of devising various e-fleet concepts. This means analysing and testing internal company car fleets as well as cooperative car pooling models that involve the use of vehicles across different companies. The issue of how to connect car sharing to multimodal mobility solutions is another major focus of the project.



Enio e-charging station, photo: Enio

It is extremely important to get vehicle users involved. Employee motivation and acceptance are vital to ensuring that the new solutions are introduced successfully.

HIGHLIGHTS ▼

- Electric mobility solutions within corporate fleets
- Car pooling and car sharing models
- Innovative technical implementation
- Test operation with six demonstration partners

BENEFITS ▼

- New business and operator models for internal company car fleets
- Connection to existing multimodal mobility solutions
- Tailored to the needs of employees



Technical implementation and test phase

Alongside the organisational and commercial aspects, technical implementation also has a crucial role to play. As part of the project, a car sharing technology was developed so that electric cars could be used within fleets in an uncomplicated and convenient manner. This technology includes a straightforward booking and billing system, route and trip planning, optimised vehicle allocation and charging, and the intelligent use of back-up batteries and energy management systems.

During the demonstration phase from May 2018 to April 2019, the solutions are to be tested at six demonstration partners (Post AG, iC consulenten, ETA Umweltmanagement, t-systems/t-mobile Austria, Spectra Today, Fronius International) using a representative number of vehicles with combustion and electric engines. Particular importance is being attached to user acceptance, cost-effectiveness and positive environmental impact. The aim is to achieve a 40% reduction in greenhouse gas emissions coupled with financially viable operation of the solutions within the demonstration fleets.



Greenride car pool, photo: greenride

“SEAMLESS aims to smooth the way as we move away from the idea of company cars as status symbols and towards the concept of mobility as a service provided by employers. This will call for a permanent transformation/paradigm shift in the thinking of company car users and employers alike. In turn, this will encourage greater use of electric vehicles within company fleets and the incorporation of alternative modes of transport (such as public transport) into everyday working life and the private sphere. At the same time, SEAMLESS will also allow technical components that are usually developed and tested independently of one another to be brought together into one cohesive whole so that it is easier for companies to switch over to a future-oriented mobility solution.”



Photo: AIT

Matthias Prandtstetter
Project Leader, SEAMLESS
AIT Austrian Institute of Technology

CMO CLEAN MOTION OFFENSIVE

In this project coordinated by the Automotive Cluster Business Upper Austria - OÖ Wirtschaftsagentur GmbH, twelve project partners (business and research companies) worked together on the “Clean Motion Offensive” with a view to developing powerful electric mobility technologies that are perfectly in line with the needs of the market. The main barriers preventing the spread of electric mobility are the high costs of the battery, the short range of the vehicles and the lack of a proper infrastructure. Moreover, as the number of electrically powered vehicles increases, extensive demands are placed on the grid operators. To address all the relevant issues, forward-looking concepts and solutions were devised as part of the CMO project.



CONTACT

Wolfgang Komatz
Automobil-Cluster
Business Upper Austria –
OÖ Wirtschaftsagentur GmbH
wolfgang.komatz@biz-up.at

PROJECT PARTNERS

Business Upper Austria – OÖ
Wirtschaftsagentur GmbH /
Automotive Solutions GmbH /
University of Applied Sciences
of Upper Austria, Wels campus /
KEBA AG / Lagermax Lagerhaus
und Speditionen AG / Lightweight
Energy GmbH / LINZ Strom
GmbH / reload multimedia /
Smart E-Mobility / STEYR
MOTORS GmbH / Technology
& Innovation Center TIC Steyr
GmbH / Graz University of
Technology

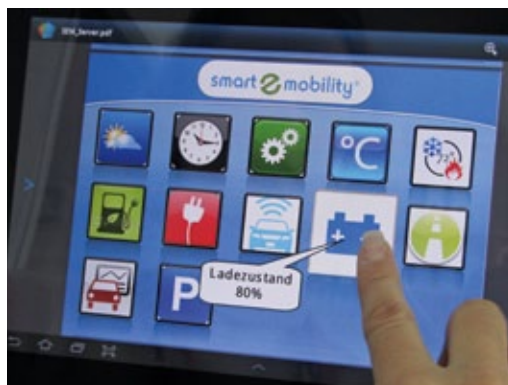
The team involved in this Upper Austrian initiative consisted of engine builders, industrial automation companies, a power company and two research institutions. The Clean Motion Offensive involved working through the entire chain, from the vehicle technology and the establishment of an intelligent infrastructure right through to new business models. The key focus was on finding solutions to make electric vehicles suitable for everyday use as part of fleets. All the vehicle technologies were installed in a test vehicle and then put to the test in practice in the “Model Region” of Steyr.

Vehicle technology

To extend the range of the vehicle, STEYR MOTORS developed a two-cylinder range extender as part of the Clean Motion Offensive. This runs on biodiesel and extends the range of electric vehicles by 150 to 200km. At Graz University of Technology, a prototype flywheel energy storage system was built. Acting as a

highly efficient energy buffer, the “flywheel” utilises the braking energy from starts and stops, takes the strain off the battery system and helps reduce energy consumption within the electric vehicle.

A new battery concept was used on the test vehicle. This combined a cost-effective lead storage battery with high-performance lithium batteries. The HESSPC (High Energy Storage System Power Controller) hybrid controller developed by Lightweight Energy allows several different energy sources to be combined in the same traction system. With the help of this intelligent energy controller, it was possible to integrate the range extender and the flywheel energy storage system into the vehicle. The vehicle development work resulted in a fully equipped test carrier (a converted Skoda Roomster) with three interchangeable modules (“Energy Cubes”) that made it possible to test various energy storage systems and range extenders.



The SEM box collects vehicle and battery data and then evaluates this for various applications.
Photo: Automobil-Cluster



Prototype flywheel energy storage system, Photo: Graz University of Technology



Photo: Automobil-Cluster

The test carrier vehicle was used to try out the developments on various routes and with different operational profiles. This provided insights into their degree of suitability for daily use, the savings potential, the driving range and the dimensioning of the energy sources. The HESSPC controls the function of the various "Energy Cubes" (range extender, additional battery, flywheel) and integrates them into the drive system. The SEM box performs a monitoring role and supplies online data from the test runs. Inductive charging has been integrated into the operational concept and tested for its user friendliness.

ICT solutions

The interaction between the combustion and electric engines was controlled by software from Smart E-Mobility. The SEM box that was designed as part of the project enables the collection and evaluation of battery and vehicle data. The data is transmitted via a data line or GSM and is collected and processed in a central processor. Many automotive manufacturers lease the electric vehicle batteries to their customers. The SEM box is easy to integrate into the vehicle and provides the data that leasing companies and other players (power companies, municipalities, vehicle manufacturers, traffic management systems) need as a basis for their various services and billing processes.

Charging infrastructure & management

KEBA AG, Linz AG and the Wels campus of the University of Applied Sciences of Upper Austria worked together as project partners to develop a cost-effective and user-friendly charging infrastructure along with some highly automated charging management systems. This resulted in an intelligently controlled base station that distributes the energy to numerous satellite stations.

They also investigated how electric vehicles could be integrated into the grid as a controllable load. Linz AG was responsible for implementing a powerful piece of software to enable intelligent load management with grid monitoring included. >>>

"Electric mobility increases the demand for power and so the CMO flagship project analysed the environmental factors, framework conditions and methods that are involved in regulating this through reliance on automated load and charging management within an existing grid. It proved possible to overcome these challenges by using intelligent technologies on the grid side, such as smart meters or smart grids. This resulted in an intelligent load management system that included grid monitoring, the data from which was transmitted to an automatic charging management system at the e-charging station. In future, this means that it will be possible to control the charging current demand of electric vehicles in accordance with grid availability."

Norbert Breitschopf

Linz AG
CMO Project Partner



Photo: Linz AG

"Energy Cube" range extender, photo: STEYR MOTORS GmbH



BENEFITS ▼

- Biodiesel range extender that is ready for series production
- Load management – infrastructure solutions for using electric vehicles as part of fleets
- Cross-company fleet management



Photo: Automobil-Cluster

“The development of new, cost-saving components is extremely significant for suppliers based in Upper Austria. By getting ahead of the pack in those areas that have tended to be neglected by car manufacturers and power companies in the past, our firms can become international winners. New and highly lucrative spheres of activity are also emerging for the electrical and electronics sector. This is where most of the innovations for the car industry are currently being generated.

In Austria, you can find companies whose technologies are extremely advanced. Generally, these are niche technologies but they have the potential to become internationally marketable products. One of the automotive cluster's tasks is to put these companies (which are sometimes quite small) in touch with companies and research facilities at an international level. Through initiatives such as CMO or the current ICM scheme, we are creating the ideal conditions for this.”

Wolfgang Komatz

Automotive Cluster Manager

Business Upper Austria - OÖ Wirtschaftsentwicklung GmbH



KEBA wall box,
photos: KEBA AG

The data obtained from the grid is transmitted to the e-charging station and used there for load management purposes. In this way, the charging current demand can be controlled in accordance with the level of grid availability.

Successful enhancements

The CMO project has led to several other projects by cluster partners that are concerned with enhancing electric mobility components. The results from the Clean Motion Offensive were also used as part of the Emilia flagship project (see page 48).

As regards vehicle technology, the insights gained helped STEYR MOTORS to develop the “Energy Cube”, which has now been added to its product range. In the course of further development work focusing on engine-generator

applications, it was possible to build on the design know-how gained from the CMO project in relation to range extenders.

KEBA AG also benefited from the project results when coming up with new developments for the charging infrastructure. Its high-power wall boxes for private and public use are currently being marketed around the world under the KeContact brand label.

www.keba.com/en/emobility/emobility

The Clean Motion Offensive gave rise to the “Initiative Connected Mobility” (ICM). The ICM is an advanced platform that has been set up by the automotive cluster to promote new technologies for vehicles of the future.

www.connected-mobility.at

HIGHLIGHTS ▼

- Initial results obtained from on-road tests with the flywheel energy storage system
- HESSPC (Hybrid Energy Storage System Power Controller)
- SEM box for collecting vehicle and battery data
- Central evaluation of data



LINKS

www.automobil-cluster.at

www.connected-mobility.at



Project videos

<https://youtu.be/Bn9lvVHS90>

und <https://youtu.be/ROFQ9g53Fol>

EMILIA

ELECTRIC MOBILITY FOR INNOVATIVE FREIGHT LOGISTICS IN AUSTRIA

The aim of the EMILIA flagship project is to make freight logistics in urban areas more efficient and environmentally friendly in the future. 14 Austrian companies worked together on this project under the leadership of the Austrian Institute of Technology (AIT). They were developing innovative freight logistics concepts for towns and cities as well as small electrically powered transport vehicles for what is known as “last-mile distribution”.



CONTACT

Boschidar Ganev
Center for Low-Emission
Transport
Electric Drive Technologies
AIT Austrian Institute of
Technology GmbH
boschidar.ganev@ait.ac.at

PROJECT PARTNERS

AIT Austrian Institute of
Technology GmbH / Austrian
Mobile Power / Automobil-
Cluster Clusterland Oberöster-
reich GmbH / Bitter GmbH /
DPD Direct Parcel Distribution
Austria GmbH / ECONSULT
Betriebsberatungsges.m.b.H /
Gebrüder Weiss GmbH /
gleam technologies GmbH /
OVH Design / isn – innovation
service network GmbH / Leicht-
metallkompetenzzentrum Rans-
hofen GmbH / Magna Steyr AG
& Co KG / Miba Sinter Group /
Rewe International AG / Schach-
inger Logistik Holding GmbH /
SIGNON Österreich GmbH

Due to the rising population in urban areas, the issue of urban freight logistics is becoming increasingly important. Around 20% of the traffic in European towns and cities is attributable to transport and the delivery of goods. The market for courier and parcel services has been growing constantly for years. The high number of individual deliveries made to end customers means that miles and miles are being clocked up in city centres.

The negative consequences of this are noise, emissions and environmental pollution, which – in turn – reduce quality of life. According to EU targets (White Paper on Transport/2011), logistics in urban centres are to become CO₂-neutral by 2030. The lack of space and the access restrictions in towns/cities call for special solutions. How can goods be delivered in a flexible, efficient and environmentally friendly manner in the future when areas are becoming more and more densely populated?

The project was broken down into three phases, which consisted of surveying customer needs, developing innovative technological components, logistic concepts and software solutions, and then combining these in a demonstration phase.

Vehicle technology

Electrically powered vehicles offer forward-thinking alternatives for transport and delivery services within urban areas. Two innovative electric vehicles were refined and tested for the usage phase while paying particular attention to reductions in manufacturing costs and increases in vehicle range.

As part of the EMILIA project, start-up company gleam technologies teamed up with partners AIT, Bitter and MIBA to develop the ideal power train for its electric cargo bike. This bike uses an electric motor to supplement the rider's pedal power, thereby allowing heavier loads to



DPD Demo with EMILIA electric delivery tricycle ©Austrian Mobile Power, photo: Anna Lilly Wimmer



Electric Light Utility Vehicle (EVCR7) © Austrian Mobile Power, photo: Anna Lilly Wimmer



Converter for EVCR7 (Skoda Roomster) photo: ALT

be transported over greater distances and for longer. This combines human pedal power with the power of an electric motor, thereby giving the vehicle a long range.

With its tilting technology, which allows the bike and rider to lean into curves, and its suspension system, the electric cargo bike also improves ride dynamics, increases safety for the rider and cargo alike, and reduces drop costs by enabling fast deliveries. This lightweight vehicle offers all the benefits of a bike, providing quick and easy access to all urban areas at electrically assisted speeds of up to 25km/h.

A light utility vehicle (Skoda Roomster) was converted into an electric light utility vehicle. This involved installing a new high-efficiency engine that was both lightweight and low-cost, along with a brand-new type of high-current inverter designed to achieve savings in terms of installation space, materials and weight.

As a result of the full redesign, the volume was more than halved compared to the last model of inverter used on the vehicle. For this, the project team drew on the developments that emerged from the Upper Austrian CMO project (see page 44). >>>

HIGHLIGHTS ▼

- Strong consortium comprising start-ups, SMEs, large corporations, research organisations, plus consulting and service companies
- Components for innovative, electrically powered transport vehicles that have a long range and are low-cost
- New freight logistics concepts based on electric mobility
- Accompanying open innovation process
- Demonstration of research results
- 2017 EMILIA was awarded the VCÖ mobility prize as one of three innovative Viennese projects for climate-friendly urban freight transport



LINKS

www.emilia-project.at



Project video

www.youtube.com/watch?v=eak8jptxlc4



Photo: Juergen Hammerschmid

„As the mobility and energy turnaround continues to gather momentum, Austria must establish itself as a renowned location for electric mobility so that it can maintain its key role in the international marketplace.

The support that has been given to various innovative technology projects in Austria represents an essential step on the journey towards electrification and the digitalisation of road traffic. These projects include the successful EMILIA flagship project, which has resulted in numerous smart and innovative solutions for CO₂-free city logistics.”

HEIMO AICHMAIER
MANAGING DIRECTOR
AUSTRIAN MOBILE POWER

Logistics concepts

New logistics concepts are required if the alternative modes of transport are to be deployed intelligently. Having a network of electric vehicles available for use in areas such as the delivery of parcels and food products can bring both ecological and economic benefits. For example, packages that are temporarily stored at a city hub can be delivered to the end customer using a fully electric vehicle. The project also investigated the feasibility of making express grocery deliveries within narrow time windows. Appropriate software solutions were developed for the selected concepts while taking account of the respective logistics requirements, and the operational processes were adapted for the demonstration phase accordingly.

Open innovation and demonstration

As many stakeholders as possible were included in the flagship project right from the start. These include logistics companies and delivery services as well as urban and transport planners, researchers, and representatives from politics and administration.



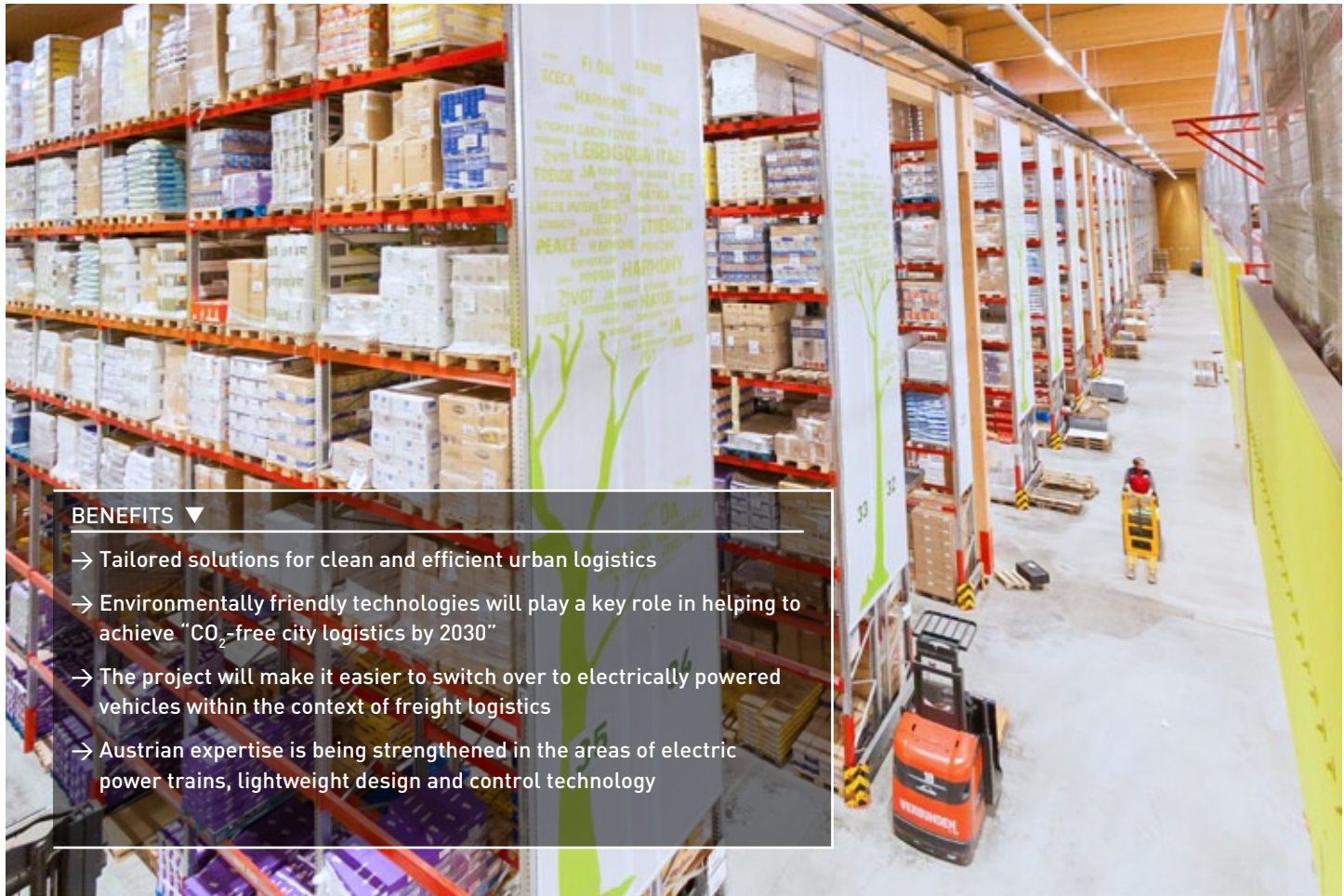
Photo: Martin Rumersdorfer/Schachinger Logistik

EMILIA was accompanied by an open innovation process. An online open ideas platform was used to get the general public involved and to find out more about the needs of users. The idea of this is to encourage acceptance of the new solutions.

The project culminated in a demonstration phase in 2017, which showed how the resulting developments (concepts, vehicles and apps) interacted on the street under real conditions. It was found that the logistics requirements could be successfully met. In the course of the demonstration, the vehicles optimised as part of the project covered a distance of more than 1,500km and delivered more than five tonnes of goods.



Photo: Martin Rumersdorfer/Schachinger Logistik



“In the long term, electric mobility is the future – and that goes for the field of freight logistics, too. However, there is still a lot of work to do before the technologies and concepts are able to compete technically and commercially with those that are already well-established – and before they can, in turn, truly conquer the market. In this regard, EMILIA has an important role to play in closing the gap between the current state of affairs and the requirements of the future. The newly developed technologies also have the potential to strengthen Austrian and European added value in electric mobility, an area that is going to be extremely important in the future.

A good example of this is the electric engine that has been developed for use in a light utility vehicle. Unlike many other designs, this one does not rely on the use of rare earth elements, which is important from a European perspective because no mining of rare earth elements takes place on the continent. The other components, such as the highly efficient compact converters, also demonstrate the expertise of Austrian companies and will help them with their long-term positioning in the markets of the future.”

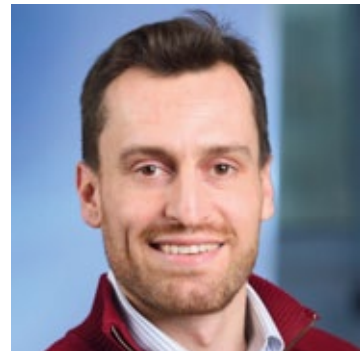


Photo: AIT/Johannes Zinner

Boschidar Ganev

Project Leader, EMILIA

AIT Austrian Institute of Technology GmbH

LEEFF

LOW EMISSION ELECTRIC FREIGHT FLEETS

Road freight transport is responsible for a large proportion of the world's greenhouse gas emissions. If electrically powered vehicles were to be used in the transport industry, the environmental impact of the transport sector could be reduced significantly. The LEEFF flagship project is seeking to develop new electric mobility solutions for freight transport along with appropriate planning and communication tools for electric fleets.

CONTACT

Bartosz Piekarz
i-LOG Integrated Logistics GmbH
bp@i-log.at

PROJECT PARTNERS

Kreisel Electric GmbH /
Oberaigner Powertrain GmbH /
SMATRICS GmbH & Co KG /
SPAR Österreichische Waren-
handels-AG / Schachinger
Logistik Holding GmbH /
Quehenberger Logistics GmbH
/ Greenway E-Mobility GmbH
/ Energie Ingenieure GmbH /
Consistix GmbH / University of
Natural Resources and Life Sci-
ences, Council für nachhaltige
Logistik (CNL) / Satiama GmbH
/ University of Vienna, Institut
für Betriebswirtschaftslehre /
University of Applied Sciences
of Upper Austria – Hagenberg
campus

The project, which was launched in 2016, covers the full range of vehicle technology, the charging infrastructure and also new business models for using electrically powered vehicles in freight fleets. Under the leadership of i-LOG Integrated Logistics GmbH, the project team is not only looking at technical aspects but also at organisational and socio-economic issues.

As part of the project, an electric van with an adapted battery system is being developed along with an intelligent charging station that is suitable for commercial use at logistics centres. A further aim is to come up with an innovative business model for fleet operators along with tailored planning tools (in the form of a prototype) and to test these out during a demonstration phase.

Vehicle technology

By developing an electric transporter van that is ready for series production, the hope is that new discoveries will be generated in the area of electrically powered light commercial vehicles (LCVs). The advanced e-van is to feature a 120kW rear wheel electric drive and a range of 200 to 300km. It will be equipped with an on-board charger that supports rapid charging.

A single-stage gearbox for electric vehicles is being specially developed and this will be suitable for speeds of up to 12,000rpm. It will also have a parking lock and a connection for a tachograph.

Most of the costs associated with electric vehicles are attributable to the energy storage system. The key technologies here are the battery and charging equipment. That is why research work is so focused on finding the right layout for a powerful and cost-effective battery/charging technology.

“As far as Tesla boss Elon Musk is concerned, there can be no doubt that the future of mobility is electric. It is high time that this started applying to urban delivery logistics as well. Electric stacker trucks are already used as standard in intralogistics. In view of the constantly increasing volume of e-commerce parcels, delivery vehicles such as those used for courier, express and parcel services should – ideally – also play their part in minimising noise and emissions in the main conurbations. Particularly in the case of major cities that are growing strongly, such as Vienna, this is becoming an important part of the smart city concept. Together with our top project partners, we want to make a major contribution in this regard.”

Bartosz Piekarz

Project Leader, LEEFF
i-LOG Integrated Logistics GmbH



Photo: i-Log GmbH



HIGHLIGHTS ▼

- Enhancement of electric vehicles for use in freight fleets
- Solutions for creating an intelligent charging infrastructure
- New fleet concepts
- Optimisation of mixed fleets
- Innovative operating and business models
- New logistics, scheduling and routing solutions
- Integration of user needs

Lithium-ion battery packs are being optimised so that a higher energy density (4.1kg/kWh and 1.95dm³/kWh) can be achieved for various applications with a low-weight solution that is more compact. The development work also encompasses the thermal management of the batteries plus optional use of the batteries for active vehicle heating and cooling. Several charging strategies (from high-performance charging through to battery changes) are being investigated as part of the project.

Optimisation of charging management and planning tools

As far as the charging infrastructure is concerned, ICT-based solutions are being devised to enable charging control and energy management within a commercial fleet setting. The process of integrating these technically into existing fleet management systems is being

analysed and tested. The project also involves developing prototypes for a new fleet management tool and a mobile application that will actively support drivers. Intelligent routing and planning tools are the key to implementing electric mobility successfully within a route-planning context.

The new technologies are being combined with suitable business models with a view to creating something that is both cost-effective and highly convenient for users. Since January 2017, a larger demonstration fleet has been demonstrating the developments at the Hörsching logistics park and Linz logistics centre of the SCHACHINGER Logistik Group; in 2018, the plan is to extend the fleet at SPAR, Quehenberger Logistics and three other industry partners based in Greater Vienna, Graz and Innsbruck.



Photo: SMATRICES

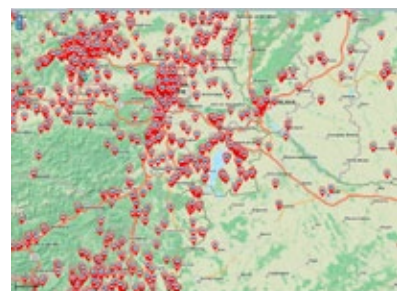


Photo: Satiamo GmbH



Photo: Greenway E-Mobility GmbH



Photo: Kreisel Electric GmbH



LINKS

www.leeff.at

E-LOG-BioFleet

FUEL CELL TECHNOLOGY FOR INDUSTRIAL TRUCKS

Battery-powered industrial trucks are a significant international market for electric drives. However, the short ranges of these vehicles and the long outage periods caused by charging reduce productivity, particularly in the case of multi-shift operation. One new technology for optimising vehicle operation consists of fuel cells with hydrogen storage that can be used as range extenders.

CONTACT

Manfred Klell
HyCentA Research GmbH
klell@hycenta.at

PROJECT PARTNERS

Fronius International GmbH
/ HyCentA Research GmbH /
JOANNEUM RESEARCH
Forschungsgesellschaft mbH
/ Linde Fördertechnik GmbH
/ OMV Refining & Marketing
GmbH / Schenker & Co AG

In the course of the E-LOG-BioFleet project, it proved possible to develop and implement this innovative concept for a logistics application, and to test it in a real-life industrial environment at DB Schenker in Hörsching (Upper Austria). This was the first time in Austria that battery-powered industrial trucks had ever been converted to allow hybrid operation with fuel cell range extenders and lithium-ion rechargeable batteries.

This involved using a Power Package developed by Fronius International in conjunction with a fuel cell, a hydrogen storage system, lithium-ion rechargeable batteries and control electronics. This system was certified and installed in twelve industrial trucks (Linde T20AP) instead of the original lead storage battery. In addition to producing the components for the drive, storage system and vehicle as a whole, the necessary infrastructure was also created.

The hydrogen is supplied using a CO₂-neutral technique. Hydrogen is produced from biomethane in a decentralised system located at the site. A fuelling system was installed inside a hall (the first time this has ever been done in Europe).

Everyday operation in a challenging multi-shift logistics facility has demonstrated that the new vehicles and the infrastructure reliably meet all the requirements in practice. The fuel cell drive system is even capable of withstanding the extreme demands of a logistics environment and has so far exhibited very good durability.

A high level of efficiency is being achieved thanks to the hybrid operating strategy and braking energy recovery technology. The fast refuelling time (< 3 minutes) means that the vehicles are constantly available. This enables greater flexibility but with the same level of performance.



Photo: Fronius International GmbH

“By the end of 2015, the industrial truck fleet at Schenker had already clocked up 40,000 successful operating hours, thereby proving that it is able to compete in terms of performance and availability. The main challenge now is to create an initial market that is large enough for the manufacturing costs of the fuel cell to become competitive as well. In other regions of the world (e.g. the USA), markets are being created by means of appropriate incentive programmes. Therefore, rapid action is required to ensure that Austria and Europe also become a source of the technology and don't just end up importing it.”

Ewald Wahlmüller

Project Leader, E-LOG-BioFleet
Fronius International GmbH



Photo: Fronius International GmbH



BENEFITS ▼

- Reliably available H₂ industrial trucks with a longer range than conventional battery sets
- Not having to change the battery makes work easier and saves money
- It only takes a few minutes to refuel the H₂ vehicle

HIGHLIGHTS ▼

- Strengthening of Austria as a technology leader in the area of range extenders for logistics applications
- Implementation of the entire value-added chain
- Development and production of all components for the new industrial trucks
- Establishment of the infrastructure: Biomethane-generating plant and fuelling system
- Maintenance and servicing solutions
- Successfully tested with regard to efficiency and service life

Fleet data
(as at official project end date / rounded):

- > Operating hours: 44,000h
- > Fuel cell operating hours: 24,000h
- > Number of start/stop cycles: 52,000
- > Driving cycle efficiency (tank-to-plug): 53%
- > Refuelling operations: 6,300

An extended demonstration phase yielded valuable information, particularly in relation to the service life of the overall system under real-life operating conditions. To minimise the maintenance and servicing requirements, various types of optimisation were performed on individual

components. In addition to the technological advantages, a high level of acceptance among users is the other main prerequisite for ensuring an efficient and competitive market entry.

In light of the extremely positive project results, it was decided that operation should continue after the official project end date (30 June 2016) and the vehicles are still being used successfully today. As part of the FCH REFuel follow-up project, the hydrogen production technology is being switched over to high-pressure PEM electrolysis to enable a CO₂-free supply.



Photo: Severin Wurnig

"The E-LOG-BioFleet project demonstrates that hydrogen and fuel cell equipment is a drive technology of the future that is already functioning in practice. In this way, we are backing up our claim to be the most innovative logistics company within the industry."

THOMAS ZIEGLER
MANAGER
OF THE LINZ BRANCH
OFFICE OF
SCHENKER & CO AG



Photo: HyCentA Research GmbH



Project videos

<https://youtu.be/Ox98Psy6D04>

und <https://youtu.be/RF8hu1pYHZY>

RE²BA

RECYCLING AND REUSE OF LITHIUM-ION BATTERIES

A new concept for recycling battery systems from electric mobility products should help to optimise the costs and, in turn, make electric mobility more cost-effective as a whole. This was the first time ever within the German-speaking world that the technical suitability of these batteries for storing electricity from renewable sources has been tested. This is known as “peak shaving” (i.e. storing energy for use during peak demand periods).

CONTACT

Astrid Arnberger
Saubermacher Dienstleistungs AG
a.arnberger@saubermacher.at

PROJECT PARTNERS

Saubermacher Dienstleistungs
AG / AVL List GmbH / KTM AG /
Montanuniversität Leoben
(University of Leoben) /
Smart Power GmbH & Co KG

In the RE²BA project, partners from industry and research have investigated the recyclability and reusability of high-voltage battery systems from electric mobility products. They were testing a recycling process that had already been developed for used industrial batteries to find out how flexible it is with regard to different chemical structures.

The first step was to evaluate the state of the art and to draw up a catalogue of requirements for the recycling and reuse of these batteries. One of the key factors was determining the technical and legal status of end-of-life batteries (i.e. the waste characteristic). For this purpose, a suitable control tool (decision making tree) was defined. The way the batteries are handled subsequently is heavily dependent on the stipulations of waste legislation and the technical transport requirements. A knowledge of their chemical composition is vital for assessing the cost-effectiveness of a reprocessing plant. With a view to optimising recyclability as early as possible, some optimum design factors were defined.

The flexibility of the recycling process was tested in practice at pilot plants based at the project partner sites in Graz and Leoben. These are equipped with all the relevant plant components (shredder, air separator, sifter, conveyor belts etc.).

In order to meet the stringent safety requirements, the team also devised optimised collection, logistics and storage concepts for the used-battery systems. These are to serve as a decision-making basis for manufacturers and disposal firms as well as for public authorities.

A long-term test was carried out at Smart Power GmbH & Co KG (one of the project partners) in Garching near Munich to analyse the reusability of the batteries on the basis of a used-electric-mobility-battery-system. Here, they tested whether these battery systems (which generally still have 80% of their capacity) are suitable for use as storage media. Tests were carried out with a number of sample households that have photovoltaic systems installed to determine whether the batteries are suitable for increasing self-consumption of the PV electricity generated. The results are extremely promising. A battery system from an electric motorbike would, for example, be sufficient to act as a storage system for a standard home PV system with an installed power of approximately 5kWp.

In 2017, the project won the Energy Globe Styria Award and the national Energy Globe Award.

www.energyglobe.at/de_at/award-1/info-seiten-der-bundeslaender/steiermark/preistraeger-2017/
www.energyglobe.at/de_at/award-1/austria/2017/erde/



Recycling batteries at Saubermacher,
photo: Climate and Energy Fund /
Astrid Bartl



RE²BA pilot plant for recycling batteries at Saubermacher, all photos: Climate and Energy Fund / Astrid Bartl

HIGHLIGHTS ▼

- Catalogue of requirements for reusing and recycling batteries from electric vehicles
- Decision-making tree for determining end-of-life status
- Collection, logistics and storage concepts
- Initial practical tests for utilising used batteries as a storage system for PV-generated electricity
- Enhancement of the LIBRES recycling process



Photo: Smart Power GmbH & Co. KG



EFFICIENCY OPTIMISATION BY DEVELOPING ADVANCED ELECTRIC TRANSMISSIONS FOR LOWEST EMISSIONS IN WHEEL LOADER APPLICATIONS

While the extensive trend towards electrification has mainly created production-ready solutions in the field of the automotive industry, current sociopolitical activities indicate clearly that a new era in this sector has begun faster than expected, and that the demand for particularly low-emission or even local zero-emission drives in construction and mobile machinery is imminent.

CONTACT

Hans Knapp
Chief Engineer for Advanced
Development and Power Train
Wheel Loader
Liebherr-Werk Bischofshofen
GmbH
hans.knapp@liebherr.com

PROJECT PARTNERS

Vienna University of Technology
TU WIEN, Institute of Mechanics
and Mechatronics, Division of
Control and Process Automation
/ KRISTL, SEIBT & Co GmbH /
HYDRIVE Engineering GmbH

With its hydraulic-mechanical XPower® power split transmission, Liebherr today already has by far the most efficient wheel loader drive in the large-size segment. This has been impressively demonstrated through independent comparison runs by renowned companies in the building materials industry on the basis of the lowest fuel and energy consumption, respectively. In the industry, Liebherr is perceived as the worldwide leader in technology in its capacity as an Austrian manufacturer of construction machinery.

In order to further minimize energy consumption and emissions, it is necessary to continuously improve the efficiency behaviour of highly developed drives. In reaching this goal, electrification plays a key role – but not in the form of conventional, electric drive structures, which is highlighted by recent examples.

Attempts by competitors to gain a foothold with hybrid-electric drives have not been successful so far, since the efficiency behaviour, on the



Photo: Liebherr

one hand, has fallen short of expectations, and expenses, on the other hand, are many times higher as compared to highly developed hydraulic-mechanical drives.

Therefore, the focus lies on increasing the efficiency of traditional drives through more

„By research on electric components and driveline structures we focus on several goals. Electric drives feature low power losses, thus improving the overall efficiency also on construction machinery. This leads to lower energy consumption and less exhaust emissions. In combination with emission-free energy sources like batteries and fuel cells, the vehicles will be without any local emissions. By means of this project we want to prepare our construction machinery for this next technology step.“

Herbert Pfab

Product Development Manager Wheel Loader
Liebherr-Werk Bischofshofen GmbH



Photo: Liebherr



advanced electric ones. This may be considered as the “way-in“ for gaining ground in the electrification of the construction and mobile machines industry, thus opening doors to new possibilities:

- > Low energy consumption is the key for the achievement of large ranges of operating time with regard to battery-powered equipment.
- > Reduction of vehicle emissions to a minimum wherever battery-powered equipment cannot be deployed.
- > Pioneer for the replacement of combustion engines with fuel cells.
- > Cost-optimized components due to low energy consumption.

HIGHLIGHTS ▼

- Advanced electric powertrain concepts considering electric drive technology to be able to further increase efficiency
- Researching on key technology enabling zero-emission battery powered concepts in wheel loader applications
- Minimizing combustion engine emissions to the lowest level where battery technology is limiting
- Transmission architectures will be developed, suitable electric components and battery technology will be identified



Photo: Liebherr



LINKS

www.liebherr.com

FORWARD-THINKING R&D SCHEMES FROM THE LATEST CALL FOR PROJECTS

Some very exciting new flagship projects are due to be launched in 2018. These will explore forward-thinking technology and new fields of application in electric mobility.

EMPA-Trac ELECTRIC MODULAR PLATFORM ARCHITECTURE-TRAC

CONTACT

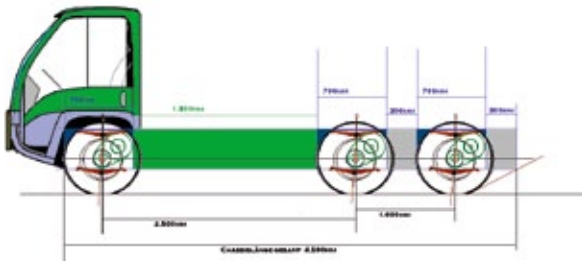
Peter Kainz
Adolf TOBIAS GesmbH
peter.kainz@stmk.or.at

PROJECT PARTNERS

AIT Austrian Institute of Technology GmbH / Hellpower Energy e.U. / TÜV Austria Automotive GmbH

The EMPA-Trac project intends to utilise electric drive technology for municipal vehicles (street cleaning, snow clearing and gritting, grounds maintenance, etc.). The concept is based on a modular electric drive platform that can be produced very efficiently and cost-effectively thanks to a common parts strategy. The partners that make up the EMPA-Trac consortium are AIT Austrian Institute of Technology GmbH, Hellpower Energy e.U., Adolf TOBIAS Gesellschaft m.b.H. and TÜV Austria Automotive GmbH.

Given that vehicles for municipal applications are so highly customised, it makes sense to use a modular electric drive platform because versions with two, three or even four axles can then all be built from the same modules without too much additional development effort.



Pictures: kainz@tobias.at

By adding electric power take-offs (E-PTO), the vehicle can be precisely tailored to the actual application requirements. This significantly reduces the manufacturing costs for the vehicle hardware, thereby making it possible to compensate for the costs of the battery pack.

Careful attention is paid to the applicable licensing criteria and safety standards from the moment the researchers start work on developing the components and modules.

The project envisages testing the drive platform with a street-legal prototype in various application scenarios. The cooperation partners will consist of carefully selected municipalities from the climate and energy model region of Tullnerfeld-Ost. These partners will be responsible for providing real-life data for the vehicle concept from both summer and winter operation.

The aim after that is to develop the EMPA-Trac drive platform further and get it ready for series production as quickly as possible.

www.empa-trac.eu





Photo: Flughafen Wien AG

CO₂ neutral ePort

COMPLETE CONCEPT FOR CLIMATE-NEUTRAL TRANSPORT AT VIENNA INTERNATIONAL AIRPORT

The aim of this project is to lay the foundations for making transport at Vienna Airport CO₂-neutral. Due to its sprawling nature, the huge daily flows of people, and the density of development at the site, the territory of Vienna International Airport constitutes a highly urban economic area. In view of the volume of traffic and the regional infrastructure, the airport site can be viewed as a “model city”.

If you were to measure it in terms of its energy consumption, the “Airport City” would probably rank among the six most energy-intensive cities in Austria. The operational fleet at Vienna Airport is made up of nearly 1000 vehicles, consuming three million litres of diesel in 2016. From a regional energy supply perspective, the airport is characterised by internal and local power networks, making it an ideal demonstration area for exploring energy-related issues.

As part of the flagship project, a complete concept is to be developed for Vienna Airport to serve as a sample solution for switching the fleet over to electric mobility technology.

The concept includes an innovative battery system, a charging station with an integrated storage facility (to act as a buffer for peak loads) and a prototype for special-purpose vehicles. Further down the line, the idea is to build on the project results by switching over to electric mobility in stages (vehicle fleet, charging pillars, storage systems).

The distinguishing mark of the project is that it will take a holistic view of the topic. For instance, it will also consider what effect the expansion of the charging infrastructure will have on a local power network. The operational behaviour of the new products should allow CO₂-neutral charging processes to be achieved in real time without having to wait until the annual energy balance sheet is produced.

CONTACT

Stefan Kovacs
Flughafen Wien AG
s.kovacs@viennaairport.com

PROJECT PARTNERS

im-plan-tat Raumplanungs-GmbH & CoKG / Spectra Today GmbH / Enio GmbH / Hitzinger GmbH / Kreisel Electric GmbH & CoKG / Kreisel Systems GmbH / Robert Freund Energie.Effizienz. Beratung / Schöberl & Pöll GmbH / Vienna University of Technology TU WIEN, Institute of Energy Systems and Electrical Drives / Wien Energie GmbH

Photo: Flughafen Wien AG



Photos: MAN



MEGAWATT-LOGISTICS

ELECTRIC TRUCKS FOR CLEAN CITY LOGISTICS

CONTACT

Werner Müller
Council für nachhaltige Logistik
(CNL) (Council for Sustainable
Logistics)
University of Natural Resources
and Life Sciences, Vienna
cnl-team@boku.ac.at

PROJECT PARTNERS

EVN AG / i-LOG Integrated
Logistics GmbH / Kairos –
Institut für Wirkungsforschung
& Entwicklung / LSG Building
Solutions GmbH / Magna Steyr
Fahrzeugtechnik AG & Co KG
/ Netz Niederösterreich GmbH
/ Österreichische Post AG /
Quehenberger Logistics GmbH
/ REWE International Lager &
TransportgesmbH / Schachinger
Logistik Holding GmbH / SMAT-
RICS GmbH & Co KG / SPAR
Österreichische Warenhandels-
AG / Stiegl Getränke & Service
GmbH & Co.KG / VERBUND
Solutions GmbH

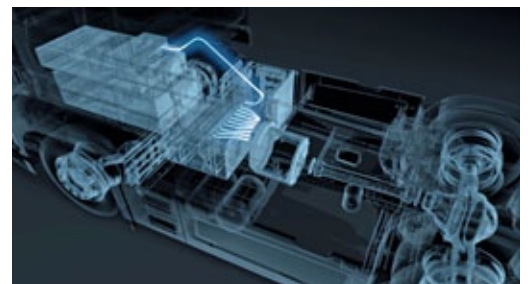
Logistics companies that operate heavy commercial vehicles face a major challenge when it comes to switching their diesel fleets over to electric ones. There are high financial risks connected with investing in electric freight fleets and in the associated charging and grid infrastructure required to support a power consumption rate of several megawatt hours per day.

The MEGAWATT-LOGISTICS project – which is being led by the University of Natural Resources and Life Sciences, Vienna – is set to devise solutions that will enable logistics companies to switch over to electrically powered HGVs in a cost-effective manner.

The project partners consist of various Austrian trading and logistics companies, power companies, grid operators and charging infrastructure providers. The project will involve carrying out a three-year road test with 26-tonne electric vehicles in five different application scenarios. The research is to focus on the following business areas: branch deliveries, delivery logistics, the transportation of goods from local distribution centres to production sites, beverage deliveries and internal company deliveries.

To allow for the dynamic nature of this sector, workshops will be run so that discussions can be held with commercial vehicle manufactur-

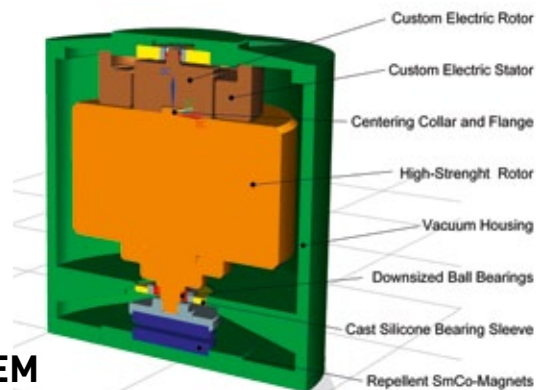
ers about the kinds of charging infrastructure solutions that will be required in the future. On the basis of the data obtained from the road test and workshops, simulations will be used to develop planning tools for logistics companies and power companies. The aim here is to cut the total investment costs by 10 to 15% compared with an investment strategy where there are no simulation-based planning tools. Over the life of the project, the aim is to reduce greenhouse gas emissions by around 3600 tonnes of CO₂ while also cutting particulate matter and nitrous oxide emissions.



Pictures: MAN

FlyGrid

HIGH-POWER FLYWHEEL ENERGY STORAGE SYSTEM FOR RAPID CHARGING WITHOUT BURDENING THE GRID



Picture: TU Graz

To enable the further development of electric mobility, a powerful charging infrastructure for rapid charging of electric vehicles is absolutely crucial. However, together with the rise of volatile power supply sources, constantly increasing charging powers will place a huge burden on the grid and may cause instabilities in the grid. In order to be able to offer a comprehensive rapid charging network in the future without any costly expansion of the grid, innovative solutions need to be found.

The FlyGrid project will integrate a high-performance flywheel energy storage system into an innovative and fully automatic EV charging station. This will allow high charging powers in conjunction with load leveling even when the station is connected to a conventional low-voltage distribution network. The system envisages integrating local volatile sources – such as PV modules on a car port – thereby helping to increase the share of renewables as a power source for transportation.

Other key characteristics of the concept include: the excellent cycle life of the energy storage system, the ability to feed high levels of power back into the grid and the fact that it can be easily transported as a mobile “rapid charging box” (e.g. for electric construction machinery).

With the help of this innovative technology, which can entirely be manufactured in Austria, it will be possible to achieve the following goals with high socio-economic impact:

- > To reduce the charging time for electric vehicles and increase the market penetration of electric mobility
- > To avoid costly expansion of the grid while simultaneously improving grid stability and power quality
- > To improve the integration of volatile renewable energy sources for use in the transport sector

CONTACT

Armin Buchroithner
Graz University of Technology
Institut für Elektrische Meßtechnik und Meßsignalverarbeitung
(Institute of Electric Measurement & Measurement Signal Processing)
armin.buchroithner@tugraz.at

PROJECT PARTNERS

DAU GmbH & Co KG / easelink GmbH / Energie Steiermark Technik GmbH / Energienetze Steiermark GmbH / Hitzinger GmbH / Montanuniversität Leoben (University of Leoben) Chair of Energy Network Technology (EVT) / myonic GmbH / Secar Technologie GmbH / THIEN eDrives



Picture: TU Graz

ELECTRIC MOBILITY FROM RESEARCH TO MARKET

The research that is being undertaken as part of the “Electric Mobility Flagship Programme” is of high practical relevance. The results from the completed projects are already being used successfully in many areas. This is fully in keeping with the aims of the Climate and Energy Fund because it is not simply a question of accumulating knowledge but of actually transferring this knowledge to the market in order to make a sustainable contribution towards climate protection and get the Austrian automotive (supply) industry fit for the future. Below are two examples of how knowledge has been successfully transferred to the market and a description of a market incentive programme supported by the Climate and Energy Fund.

NTT-DATA GLOBAL SUCCESS THANKS TO SUPPORT AT HOME



Thanks to the SMILE flagship project, NTT DATA Austria has been able to position itself globally as a mobility expert.

In 2017, it doubled the number of employees working in the area of intelligent mobility (i-Mobility) and had global responsibility for a mobility platform and worldwide expertise in integrated mobility – this is just a snippet of NTT DATA Austria’s success story.



By participating in a flagship project and making strategic use of the available Austrian funding, the Viennese branch of this internationally leading IT provider has turned itself into a global player within the electric mobility sector.



It was right back in 2011 that NTT DATA Austria helped initiate the SMILE (Smart Mobility Info & Ticketing System) flagship project. This mobility platform offers users a wide choice of different modes of transport. The associated app provides users with all the information they need in response to their request.

According to Gerhard Hagenauer – Vice President i-Mobility at NTT DATA Austria – the Austrian branch has positioned itself as a global expert within the NTT DATA Group: “Here in Vienna we have managed to double the size of our team and have become the Group’s global competence centre for ‘integrated mobility’.

From Melbourne and China right through to Argentina, people everywhere are now relying on the know-how of the Austrian competence centre.” Hagenauer is convinced that this kind of positioning would have been absolutely impossible without the SMILE flagship project.

www.nttdata.com/at

SMATRICS WHEN RESEARCH BECAME ENERGY!

SMATRICS, a joint venture between VERBUND, OMV and Siemens Austria that grew out of the eMPORA research project, is a leading provider of solutions for every aspect of electric mobility. SMATRICS is the first – and only – provider in Austria to establish a comprehensive charging network covering the whole of Austria and beyond. This high-power charging network consists of 400 charging points that are located 60km apart throughout Austria, with 100% of the electricity coming from Austrian hydro-power generated by VERBUND.

Moreover, the range of services includes tailored charging solutions for businesses as well as their employees, customers and guests. SMATRICS is a one-stop shop for all services, ranging from consulting, installing and operating the infrastructure through to custom billing models. In addition to this, SMATRICS



Source: SMATRICS

offers a modular system so that businesses can set themselves up as electric mobility providers in their own right (“powered by SMATRICS”), refines standardised SMATRICS Managed Infrastructure Modules for resellers (know-how, marketing, hardware, etc.) and takes care of processing via a B2B platform that serves as an operational interface and toolbox. This extensive know-how has already made it possible to implement dedicated charging solutions for renowned Austrian customers such as Canon, SAP, REWE International AG, Generali or VW.

SMATRICS is involved in research and funded projects at both a national and an international level. These projects include, among others, LEEFF, VECEPT, CROSSING BORDERS and eMPORA (national) and Ultra-E, EVA+ and Nemo (international).

<https://smatrics.com>

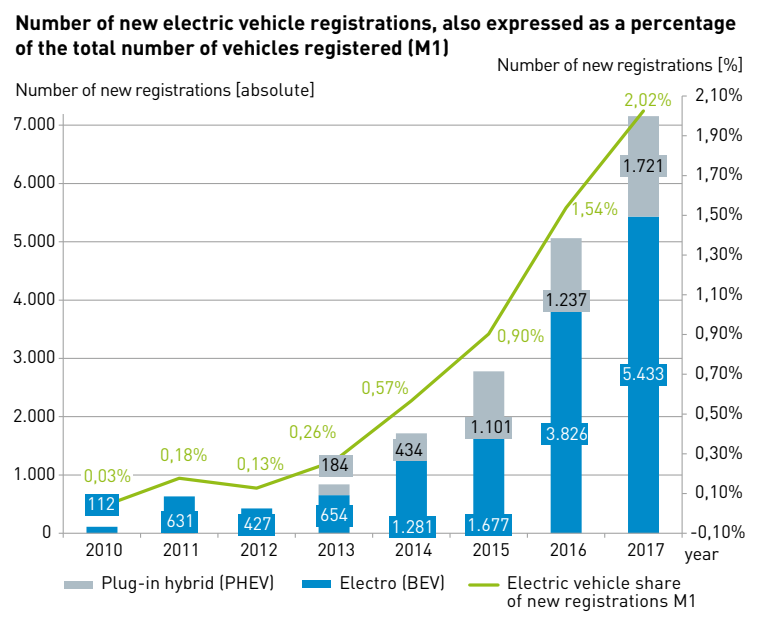


Photo: SMATRICS

E-MOBILITY SUPPORT PROGRAMME FOR MEMBERS OF THE PUBLIC

The Federal Ministry for Transport, Innovation and Technology and the Federal Ministry of Sustainability and Tourism have created a support package for the promotion of electric mobility. As part of this, and in conjunction with car importers and importers of two-wheeled vehicles, the Climate and Energy Fund has been subsidising the purchase of electric vehicles/fuel-cell-driven vehicles for members of the public since 2017. This support measure is facilitating the journey towards decarbonisation and is another way of injecting some dynamism that will encourage the spread of electric mobility. In addition to BEVs and fuel cell vehicles, the measure is also being used to subsidise plug-in and hybrid vehicles, electric motorbikes, plus wall boxes and intelligent charging cables. Having a combination of research and market incentive programmes at the heart of the Climate and Energy Fund is absolutely vital to delivering comprehensive support for electric mobility and creating optimum incentives for rapid market diffusion.

www.klimafonds.gv.at/foerderungen/aktuelle-foerderungen/2017/e-mobilitaet-fuer-private/



Source: Statistik Austria; Data status: 31.12. of the corresponding year; Presentation: AustriaTech

CONTACTS

Klima- und Energiefonds (Climate and Energy Fund)

Gumpendorfer Strasse 5/22
1060 Vienna, Austria
Tel.: +43 1 585 03 90
email: office@klimafonds.gv.at
www.klimafonds.gv.at

Electric Mobility Flagship
Programme management:
Gernot Wörther
Climate and Energy Fund
gernot.woerther@klimafonds.gv.at

Electric mobility research department at the Federal Ministry for Transport, Innovation and Technology

Henriette Spyra
Strategic Coordinator
Mobility Transformation & Transport
Decarbonisation
Federal Ministry for Transport,
Innovation and Technology
henriette.spyra@bmvit.gv.at

Evelinde Grassegger
Head of Unit,
Mobility and Transport Technologies
Federal Ministry for Transport,
Innovation and Technology
evelinde.grassegger@bmvit.gv.at

Austrian special interest groups for electric mobility

Austrian Mobile Power
Heimo Aichmaier
heimo.aichmaier@austrian-mobile-power.at

Bundesinitiative eMobility (BieM, federal
initiative for e-mobility in Austria)
Angelika Rauch
office@biem.at

Bundesverband Elektromobilität Österreich
(BEÖ, the Austrian Federal Association for
Electric Mobility)
office@beoe.at

Electric Mobility Flagship Projects

EMPORA 1 & 2

Eva Maria Plunger
VERBUND AG
eva.plunger@verbund.com

CROSSING BORDERS

Eva Maria Plunger
VERBUND Solutions GmbH
eva.plunger@verbund.com

VECEPT

Theodor Sams
AVL List GmbH
theodor.sams@avl.com

eMPROVE

Michael Nöst
IESTA – Institute for Advanced Energy Systems
& Transport Applications
office@iesta.at

eMORAIL

Angelika Rauch
tbw research GesmbH
eMORAIL@tbwresearch.org

Helmut Wolf
ÖBB–Personenverkehr AG
helmut.wolf@pv.oebb.at

Walter Slupetzky
Quintessenz Organisationsberatung GmbH
w.slupetzky@quintessenz.or.at

SMILE – simply mobile

Reinhard Birke
Wiener Stadtwerke Holding AG
reinhard.birke@wienerstadtwerke.at

SEAMLESS

Matthias Prandstetter
AIT Austrian Institute of Technology GmbH
matthias.prandstetter@ait.ac.at

CMO

Wolfgang Komatz
 Automobil-Cluster
 Business Upper Austria –
 OÖ Wirtschaftsagentur GmbH
 wolfgang.komatz@biz-up.at

EMILIA

Boschidar Ganev
 Center for Low-Emission Transport
 Electric Drive Technologies
 AIT Austrian Institute of
 Technology GmbH
 boschidar.ganev@ait.ac.at

LEEFF

Bartosz Piekarz
 i-LOG Integrated Logistics GmbH
 bp@i-log.at

E-LOG-BioFleet

Manfred Klell
 HyCentA Research GmbH
 klell@hycenta.at

RE²BA

Astrid Arnberger
 Saubermacher Dienstleistungs AG
 a.arnberger@saubermacher.at

ETA

Hans Knapp
 Chief Engineer for Advanced Development
 and Power Train Wheel Loader
 Liebherr-Werk Bischofshofen GmbH
 hans.knapp@liebherr.com

EMPA-Trac

Peter Kainz
 Adolf TOBIAS GesmbH
 peter.kainz@stmk.or.at

CO₂ neutral ePort

Stefan Kovacs
 Flughafen Wien AG
 s.kovacs@viennaairport.com

MEGAWATT-LOGISTICS

Werner Müller
 Council für nachhaltige Logistik (CNL)
 (Council for Sustainable Logistics)
 University of Natural Resources and
 Life Sciences, Vienna
 cnl-team@boku.ac.at

FlyGrid

Armin Buchroithner
 Graz University of Technology
 Institut für Elektrische Meßtechnik
 und Meßsignalverarbeitung
 (Institute of Electric Measurement &
 Measurement Signal Processing)
 armin.buchroithner@tugraz.at

LIST OF ABBREVIATIONS

AMP.....	Austrian Mobile Power
BEV.....	Battery Electric Vehicle
BEÖ	Bundesverband Elektromobilität Österreich (Austrian Federal Association for Electric Mobility)
BieM	Bundesinitiative eMobility Austria (federal initiative for e-mobility in Austria)
bn.....	Billion
BMNT.....	Bundesministerium für Nachhaltigkeit und Tourismus (Federal Ministry of Sustainability and Tourism)
BMVIT.....	Bundesministerium für Verkehr, Innovation und Technologie (Federal Ministry for Transport, Innovation and Technology)
CEGC.....	Central European Green Corridors
CO ₂	Carbon dioxide
D-A-CH	Deutschland-Österreich-Schweiz (Germany-Austria-Switzerland)
EEL.....	Electrical and Electronics Industry
EV.....	Electric Vehicle
GSM.....	Global System for Mobile Communications
HEV	Hybrid Electric Vehicle
HVAC	Heating, Ventilation and Air Conditioning
IAO	Fraunhofer-Institut für Arbeitswirtschaft und Organisation (Fraunhofer institute for work management and organisation)
ICM.....	Initiative Connected Mobility
ICT.....	Information and Communication Technologies
IEA	International Energy Agency
IPHE	International Partnership for Hydrogen and Fuel Cells in Economy
km/h.....	Kilometres per hour
kW.....	Kilowatts
kWh.....	Kilowatt hour
kWp	Kilowatt peak
MW.....	Megawatts
NOVA.....	Normverbrauchsabgabe (standard consumption tax)
NO _x	Nitrogen oxide
ÖBB	Österreichische Bundesbahnen (Austrian Federal Railways)
OEM.....	Original Equipment Manufacturer
ÖPNV	Öffentlicher Personennahverkehr (local public transport)
PHEV	Plug-in Hybrid Electric Vehicle
PKW.....	Personenkraftwagen (passenger car)
PPP	Public-Private Partnership
PT.....	Public Transport
PV.....	Personenverkehr (passenger transportation)
REEV	Range Extended Electric Vehicle
REX.....	Range Extender
SMEs.....	Small and Medium-sized Enterprises
TEN-T.....	Trans-European transport networks
TÜV	Technischer Überwachungsverein (technical inspection service provider)
V2G.....	Vehicle-to-Grid
WKO	Wirtschaftskammer Österreich (Austrian Federal Economic Chamber)
ZSE.....	Západo slovenská energetika

SOURCES

Proportion of greenhouse gas emissions in Austria that are attributable to transport, Environment Agency Austria, www.umweltbundesamt.at/umweltschutz/verkehr/auswirkungen_verkehr/verk_schadstoffe/verk_treibhausgase/

EU climate and energy goals
http://europa.eu/rapid/press-release_IP-14-54_de.htm

Environment Agency Austria, Klimaschutzbericht 2017 (Climate Protection Report 2017)
www.umweltbundesamt.at/fileadmin/site/publikationen/REPO622.pdf

White Paper on Transport
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:DE:PDF>

European Strategy for Low-Emission Mobility
https://ec.europa.eu/transport/themes/strategies/news/2016-07-20-decarbonisation_en

Reduction in CO₂ emissions of new passenger cars
https://ec.europa.eu/transport/modes/road/news/2017-11-08-driving-clean-mobility_en

Directive 2014/94/EU on the deployment of alternative fuels infrastructure
<http://eur-lex.europa.eu/eli/dir/2014/94/oj>

Austrian strategic framework „Saubere Energie im Verkehr“
www.bmvit.gv.at/verkehr/elektromobilitaet/downloads/strategierahmen.pdf

IEA Global EV Outlook 2017, Paris 2017

China Automotive Information Net, Bloomberg New Energy Finance; Handelsblatt
www.sueddeutsche.de/wirtschaft/e-mobilitaet-china-fuehrt-quote-fuer-e-autos-ein-1.3687137

M. Aasness, J. Odeck: The increase of electric vehicle usage in Norway: incentives and adverse effects, European Transport Research and Review, 7: 34, 2015

Austria in top ten for charging stations
www.vcoe.at/news/details/vcoe-oesterreich-bei-e-ladestationen-in-europa-unter-top-10-in-niederoesterreich-die-meisten-e-ladestationen

Charging infrastructure comparison International/Austria
<https://smatrics.com/news/geladen-wird-zuhause-oder-am-arbeitsplatz>

E-MAPP – E-Mobility and the Austrian Production Potential, Fraunhofer Austria, Austrian Mobile Power and the Virtual Vehicle Research Center on behalf of the Climate and Energy Fund, 2016
www.klimafonds.gv.at/assets/Uploads/Presseaussendungen/2016/eMapp/E-MAPPStudie.pdf

e-tankstellen-finder.com
retrieved 31 January 2018

<https://smatrics.com/ladenetz>

Bundesverband Elektromobilität Österreich
www.beoe.at/ladenetz/

Environment Agency Austria: Ökobilanz alternativer Antriebe (life cycle assessment of alternative drives)
www.umweltbundesamt.at/fileadmin/site/publikationen/DP152.pdf

Faktencheck Klima- und Energiefond (Fact Check of the Climate and Energy Fund), 2017, p.11, own calculations

www.fahrzeugindustrie.at/zahlen-fakten/wirtschaftsfaktor-automobil/

www.umweltbundesamt.at/aktuell/presse/lastnews/news2017/news_170831/

Evaluierung des Forschungs- und Technologieprogramms „Leuchttürme der Elektromobilität“ im Auftrag des Klima- und Energiefonds (Evaluation of the “Electric Mobility Flagship Programme” for research and technology on behalf of the Climate and Energy Fund), Prognos AG, Berlin 2017

www.klimafonds.gv.at/foerderungen/aktuelle-foerderungen/2017/e-mobilitaet-fuer-private/

IMPRINT

MEDIA OWNER

Klima- und Energiefonds (Climate and Energy Fund)
Gumpendorfer Strasse 5/22, 1060 Vienna, Austria
Tel.: +43 1 585 03 90
Fax: +43 1 585 03 90-11
email: office@klimafonds.gv.at
www.klimafonds.gv.at

RESPONSIBLE FOR THE CONTENT

Klima- und Energiefonds (Climate and Energy Fund)
Version of: April 2018

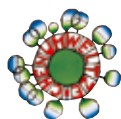
All quotations and any views expressed in interviews merely reflect the personal opinions of the individuals concerned. We have produced this brochure with the utmost care and have checked the data and information provided within it. Nevertheless, some mathematical rounding, typographical and printing errors may remain.

EDITORIAL OFFICE, PROJECT MANAGEMENT, DESIGN, PRODUCTION

Projektfabrik Waldhör KG
Am Hof 13/7, 1010 Vienna, Austria
www.projektfabrik.at

PRINTED BY

Ueberreuter Print & Packaging GmbH, Korneuburg



gedruckt nach der Richtlinie
des Österreichischen
Umweltzeichens, Ueberreuter Print
& Packaging GmbH, UW 718



Id-No. 187125
www.druckmedien.at



