HCU WORKING GROUP "ENVIRONMENTALLY SOUND URBAN AND INFRASTRUCTURE PLANNING"
INTERNATIONAL PROJECT: SINO-GERMAN ELECTROMOBILITY RESEARCH

Conference Documentation

International Conference

E-Mobility: Challenges for Technology and Urban Infrastructure Development

27. - 29. September 2016, HCU Hamburg

supported by:

Conference Documentation

E-Mobility: Challenges for Technology and Urban Infrastructure Development

Workpackage 5.2: E-Mobility and Urban Development
SINGER - Sino-German Electromobility Research

Authors: Dipl.-Geogr. Johannes Lauer
Prof. Dr.-Ing. Wolfgang Dickhaut

HafenCity Universität Hamburg (HCU)
Universität für Baukunst und Metropolenentwicklung
Fachgebiet „Umweltgerechte Stadt- und Infrastrukturplanung“
Überseeallee 16, 20457 Hamburg

Website: www.hcu-hamburg.de/e-mobility
Email: e-mobility@hcu-hamburg.de

Modellregionen Elektromobilität

Gefördert durch: Bundesministerium für Verkehr und digitale Infrastruktur

Koordiniert durch: NOW Nationale Organisation Wasserstoff- und Brennstoffzellentechnologie

Hamburg, 2017

Title image:	f.l.t.r.: Dr.-Ing. Walter Pelka (President of HafenCity University Hamburg), Mr. YIN (Counselor „Science and Technic" of the Chinese Embassy in the Federal Republic of Germany, Ministry of Science and Technology of the People's Republic of China), Katharina Fegebank (Deputy-Mayor of the Free and Hanseatic City of Hamburg and Senator of the Department of Science, Research and Gender Equality), Prof. Dr.-Ing. Wolfgang Dickhaut (Conference Moderator and Professor at HafenCity University Hamburg), Birgitta Worringen (Deputy Director-General, Department Policy Issues, German Federal Ministry of Transport and Digital Infrastructure BMVI), Johannes Lauer (Conference Organizer and Research Associate at HafenCity University Hamburg)
Source:	Tuo Li

CONTENT

04 INTERNATIONAL EXPERIENCE: URBAN INFRASTRUCTURE 35

05 WORKSHOPS: URBAN INFRASTRUCTURE DEVELOPMENT 47

06 ATTACHMENT 51

Photo: Peking University Shenzhen Graduate School

01
SINO-GERMAN ELECTROMOBILITY RESEARCH (SINGER)

Photo: Philipp Plum

1.1 SINGER project background

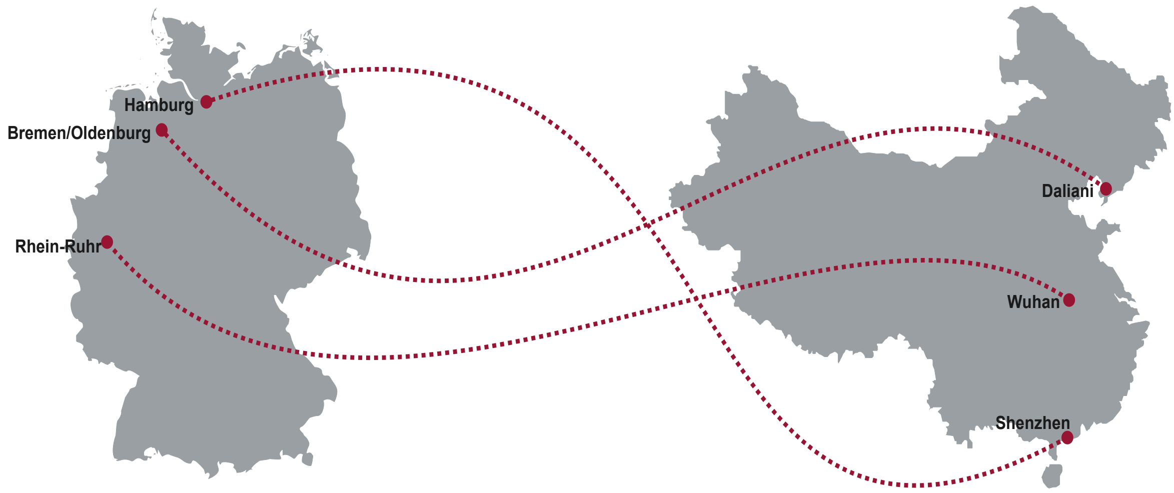


Fig.: Sino-German Model Regions Electromobility
Source: Butsch (2016: 7)

This documentation is embedded into the international project „Sino-German Electromobility research (SINGER)" between the model regions electromobility Hamburg and Shenzhen. Overall, the three German model regions electromobility cooperate with Chinese demonstration regions. Hamburg with Shenzhen, the region of Bremen – Oldenburg with Dalian and the region of Rhine-Ruhr with Wuhan.

During the Sino-German Government consultations in June 2011 German Chancellor Angela Merkel and Chinese Prime Minister Wen Jiabao signed the framework of a strategic partnership in electriomobility. The German partners participate in SINGER project are funded by the Federal Ministry of Transport and Digital Infrastructure (BMVI). The NOW GmbH - National Organization Hydrogen and Fuel Cell Technology in Berlin is responsible for the national coordination of the model regions. The work packages in Hamburg are coordinated by the project control center of hySOLUTIONS GmbH. As a research partner, HafenCity University Hamburg (HCU) focuses on electriomobility and urban development, the University of Hamburg and University of Applied Sciences (HAW) focuses on advanced materials and battery technology. As a basis for the cooperation, Hamburg is a successful area for the demonstration of electromobility, including the projects e-Quartier Hamburg, Economy on Power or ePowered Fleets Hamburg.

The Chinese partners are supported by the Ministry of Science and Technology (MOST) of the People's Republic of China. Partners in

Fig.: Relevant Institutions and partner in SINGER-Project
Source: Own compilation with official logos of institutes and ministries

Shenzhen are the Shenzhen Leading Group Office for the Promotion and Application of New Energy Vehicles, led by the Shenzhen Development and Reform Commission. Research partners are the Peking University Shenzhen Graduate School and Tsinghua University, Graduate School at Shenzhen based in the university town. There were also informal cooperations with other Chinese universities, research institutions, planning institutes and with players from the state and private sector.

In addition to the Sino-German partner regions, there are five additional model regions Electromobility as well as so-called window regions for the promotion of electromobility in Germany. In the PR China, there are now 88 cities and more than 20 provinces which belong to the demonstration regions in the field of electromobility.

27.09.2016: Hamburg Universities Hold International Conference on E-Mobility

As part of the Sino-German Partnership for Electric Mobility, the topics of innovative drive technologies (propulsion systems) and related infrastructure are addressed by the German Federal Ministry of Transportation and Digital Infrastructure (Bundesministerium für Verkehr und digitale Infrastruktur, BMVI) and the Chinese Ministry of Science and Technology (MOST), demonstrating expanding technical cooperation. As a milestone for future cooperation, HafenCity University Hamburg (HCU), the University of Hamburg (UHH) and the Hamburg University of Applied Sciences (HAW) are holding the first international conference, “E-mobility: Challenges for Technology and Urban Infrastructure Development,” September 27-29. Over the three days, approximately 110 experts and politicians from 15 European and Chinese cities will discuss political instruments, battery technologies, and urban development projects on the topic of electromobility at the HCU Hamburg.

The HCU Hamburg, UHH, and HAW are cooperating with two renowned universities in China, Peking University and Tsinghua University, as part of the “Sino-German Electromobility Research” (SINGER) Project, funded by the German Federal Ministry of Transportation. The conferences will consist of presentations of scientific research, podium discussions, workshops, poster presentations, and excursions, during which the main questions of concern are: How can electromobility contribute to sustainable urban development? Which political and planning instruments successfully foster electromobility development? And what are the challenges for future technology development?

The conference begins 27 September, with up-to-date reports from the German National Organization Hydrogen and Fuel Cell Technology (NOW) and the Chinese China Automotive Technology and Research Center (CATARC) about the status quo of electromobility in Germany and China. In contributions from the Hamburg model region for electromobility and the South China mega-city of Shenzhen, the comprehensive strategies for electromobility, which have already been developed, will be described. With the conversion of municipal public transportation fleets in Shenzhen by 2020 and in Hamburg starting in 2020, coupled with a strong expansion of charging infrastructure, both cities are leading examples worldwide. The Rhine-Ruhr model region with its partner city Wuhan and the Bremen-Oldenburg model region with its partner city of Dalian have also completed successful cooperation projects. The next phase of the cooperative partnership is currently being prepared by the responsible ministries in China and Germany.

In the morning of 28 September, international case studies from Hamburg, Copenhagen, Delft, and Amsterdam are to be presented. In the afternoon, concrete urban development projects in Shenzhen and Hamburg, as well as the challenges of integrating changing infrastructure in urban areas will be discussed. In parallel technology workshops, scientists and researchers from Hamburg, Newcastle, Eindhoven, and Shenzhen will debate the current state of development in material standards for lithium ion batteries and the development of cathode materials for quick charging of electric vehicles. On the third day of the conference, 29 September, an excursion to the VW factory in Wolfsburg will offer insight into the realignment of the company in the area of electromobility.

(Source: Text translated from Brink 2016)

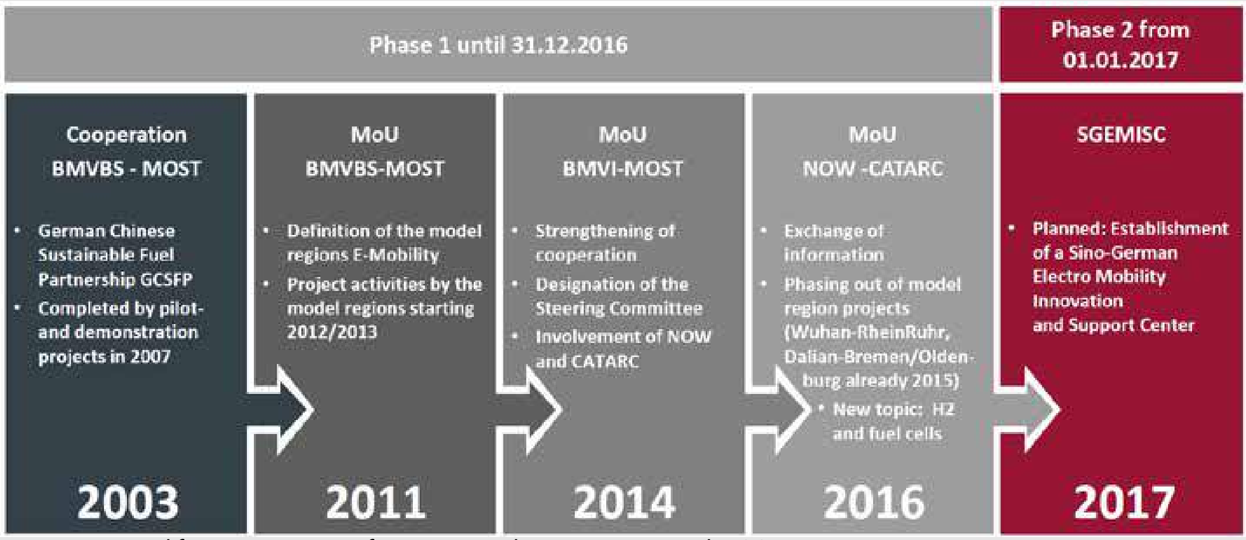
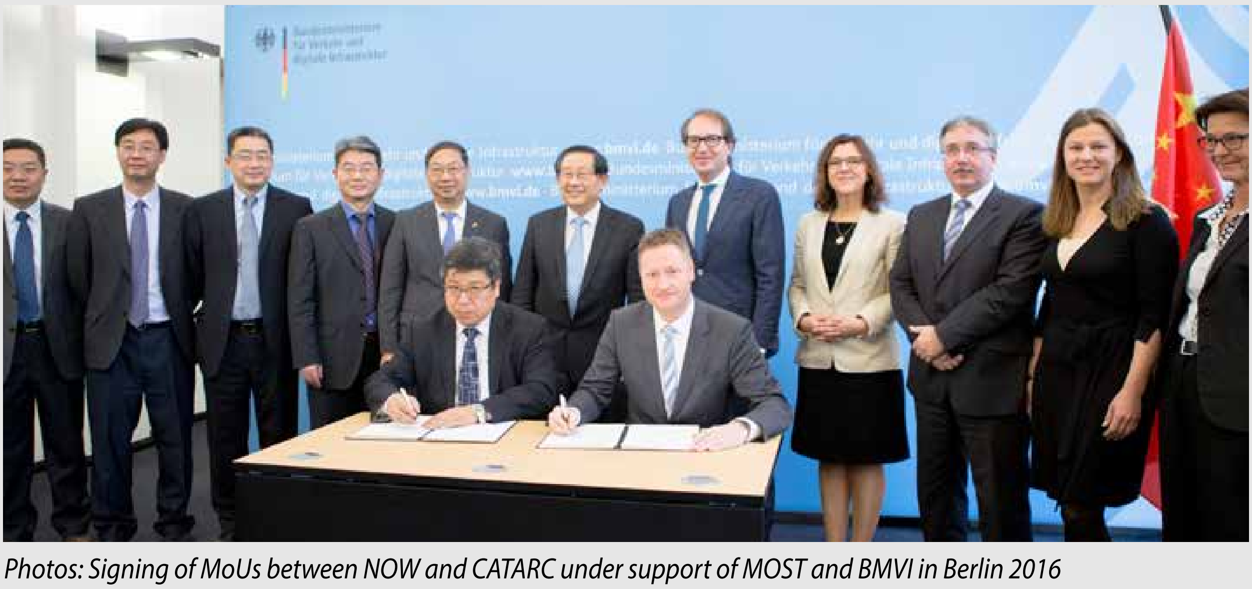


Fig.: History and future prospects of cooperation between BMVI and MOST



Photos: Signing of MoUs between NOW and CATARC under support of MOST and BMVI in Berlin 2016

SINGER-Project description

Hamburg and Shenzhen combine similar spatial scales with different requirements for promoting New Energy Vehicles (NEVs). With China's leading NEV producer BYD, Shenzhen has set up a good policy environment for industry development. Hamburg is a leading city for NEV development in Germany, but in terms of the sheer number of vehicles, Shenzhen seems to be acting faster than Germany's second-largest city.

How can electromobility contribute to sustainable urban development? Which instruments for promoting e-mobility are successful? And what are the challenges for future technological development? Utilizing these two demonstration regions, this questions will be discussed in depth within HafenCity University's Working Group "Environmentally Sound Urban and Infrastructure Planning", and in the Chemistry Department of the University of Hamburg and at the University of Applied Sciences, located in Hamburg.

HafenCity's Working Group department analyzed how users, researchers, vehicle manufacturers, corporations, infrastructure providers, government agencies, policymakers and the regulatory framework interact. Sustainable concepts and planning project components will be exposed and developed. Differing categories of projects will be defined: Urban development focusing on electromobility transition, development of an electromobility charging infrastructure and the conversion of existing inter-modal transport system towards electromobility.

The working group of Prof. M. Fröba from University of Hamburg is researching materials for lithium-ion batteries. Here especially the electrochemically active materials in the cathode are the main focus. The two main projects are standard materials for lithium-ion batteries and development of cathode materials for fast charging. In the first project, the electrochemical performance in relation to material characteristics of different commercial materials from China and Germany are compared. In the second project, nano-structured $LiFePO_4$ cathode materials for ultra-fast charging are developed.

The battery research team at the HAW Hamburg works on improving battery state detection. Sensors developed in the research group are capable of continuously measuring the electrochemical impedance spectrum (EIS), allowing precise monitoring of cell-internal components during operation, e.g. in electric cars. Data from these advanced measurements can be fed into the BMS battery state models

Photo: Stromnetz Hamburg GmbH

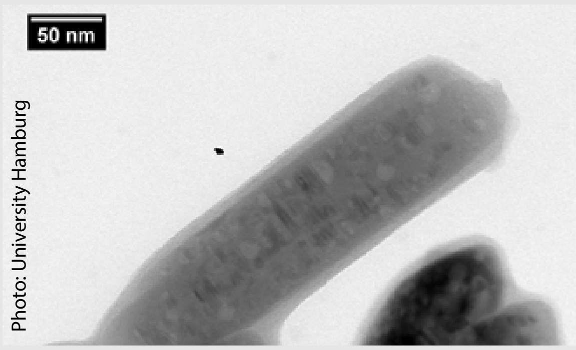


Photo: University Hamburg

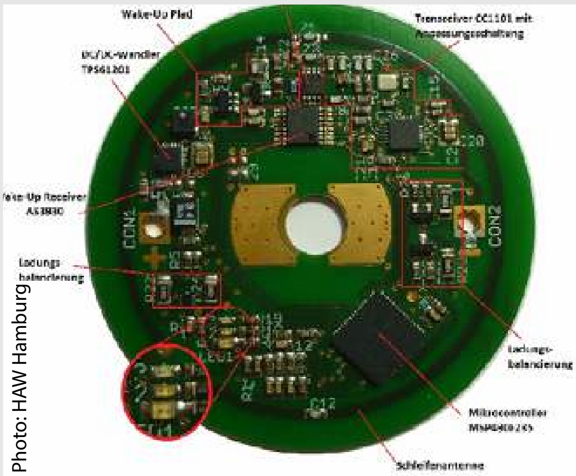


Photo: HAW Hamburg

Fig.: SINGER work packages
Source: Own compilation, based on project application documents by hySOLUTIONS (2013)

Photos: International Conference in Hamburg (2016) and SINGER Workshop PKUSZ Shenzhen (2015)
Source: Johannes Lauer (center), Peking University Shenzhen Graduate School (bottom)

1.2 Overview: E-Mobility in Hamburg and Shenzhen

Hamburg and Shenzhen as international ports and logistics hubs combines a similar spatial location and the same requirements for targeting the economically relevant core markets of the future (Fröba/Steinkamp 2014). Growth, competitiveness and prosperity of a country and its regions can only permanently secured in the age of globalization, if people and businesses adapt to changing production and market conditions and continuously produce innovations that transformed the economy into competitive products (BBSR 2012: 58).

Global mega-trends like globalization, urbanization, knowledge culture, neo-ecology and mobility have moved to new industries, such as electric mobility to the markets of the future. Large metropolises can increasingly transform future indicators such as quality of life, economic development, technological innovation, sustainability and environmental friendliness into practice (NOW 2009: 97).

Port and mega-cities are increasingly adapting to these trends. The sustainability debate, particularly for urban and transport planning gained new relevance. Climate change helps to ensure that cities have to reduce their CO_2emissions and local air pollution. Although they just occupy only three percent of the Earth's surface, cities are responsible for 60 to 75 percent of global greenhouse gas emissions and up to 80 percent of global energy consumption (UN 2016). Systematic approaches in the field of overall urban planning and in new and existing neighborhoods must be implemented.

Electromobility provides – particularly for China's urban growth – a strategic technological solution to the development of environmentally sustainable transport. This emerging focus relies on the combination of public personal mobility services, such as car sharing and a shift away from economy-based traffic towards electric vehicles. The aim of electromobility is to not only change how people drive in the current system but to also reduce traffic and begin the transition towards a city of short distances.

With the climate goals of Paris 2015, Germany and China have highlighted again its ambitions to reduce the emissions of CO_2 and other polluting emissions. In this context, cities realized that the reduction of negative impacts on environment, climate, and society are very important. „Port cities act as a specific case in this challenging context, specifically because of their location along the coast, their hub function in world trade and their industrial profile" (Van den Berg et al. 2015: 9).

How can electromobility contribute to sustainable urban development? Utilizing these two model regions, this question will be discussed in depth within HafenCity University's "Environmentally Sound Urban and Infrastructure Planning" Department, located in Hamburg. This department will analyze how users, researchers, vehicle manufacturers, corporations, infrastructure providers, government agencies, policymakers and the regulatory framework interact. Sustainable concepts and planning project components will be exposed and developed. Differing categories of projects will be defined: Urban development focusing on electromobility transition, development of an electromobility charging infrastructure and the conversion of existing inter modal transportation system towards electromobility. The resulting results will be compared, assessed and evaluated.

HAMBURG

The Free and Hanseatic City of Hamburg is with 1.8 million inhabitants and a total area of 1,814 square kilometers the second biggest city in Germany. Hamburg has 900,000 vehicles on it's roads and a density of 496 vehicles per 1000 inhabitants (2015). The city leaders expect an increasing demand for public transport and new mobility services, like e-car sharing or bike-sharing systems.

Hamburg follows a sustainable city development strategy and has a comprehensive climate protection program with a variety of concrete measures. It aims to reduce CO_2 emissions in the city by 40% until 2020. In this context, electromobility plays an important role. The European Commission awarded Hamburg as the European green capital 2011 (BMVI 2016). 2050 Hamburg wants to reduce CO_2 emissions by at least 80 percent compared to 1990 levels.

Hamburg has identified four pillars to promote electromobility as follows:

• Substitution of the complete bus fleets to electric vehicles from 2020

• The extension of the e-car sharing business in connection with the development of a decentralized public charging infrastructure to more than 1,000 charging points in future

• The successive change of the taxi fleets to electric vehicles

• The use of electric vehicles in commercial transportation, particularly courier express package services (logistics)

SHENZHEN

"China's cities suffer from high levels of air pollution, and NEVs are needed in order to reduce carbon emissions by 40-45 % by 2020, compared to 2005 levels. Eighty-eight Chinese cities and 26 provinces are part of the Chinese NEV demonstration regions. These regions serve as test sites for NEV policies and instruments. Besides Beijing and Shanghai, Shenzhen is one of the top cities for NEV development" (Lauer/Dickhaut 2016: 1045-1046).

Shenzhen City what founded in 1980 as the first Chinese special economic zone with a population of 30,000 and became known as for it's incredibly fast development. By 2015, the mega-city has more than 11 million inhabitants. With an area of 1,991 square kilometers, Shenzhen is the fifth largest Chinese city behind Shanghai, Beijing, Tianjin and Guangzhou. With a vehicle fleet of 3.3 million vehicles and a vehicle density of 270 vehicles per 1000 inhabitants, the South Chinese mega-city is only at the beginning of his mobility development. To restrict the growth in the motorized individual transport system, the City Government has limited the number plates per year to 100,000 vehicles. Without limitation, Shenzhen would have an increase of 500,000 new vehicles annual. Today, the city focus on the expansion of public transport in connection with the promotion and application of electromobility including e-car-sharing and bike-sharing.

In connection with local battery and EV-producer BYD, Shenzhen has implemented systematic incentives and restrictions for the promotion of electromobility. Technological industry upgrading, energy security, as well as the reduction of local air pollution and CO_2 emissions are the main motives.


Photo: www.mediaserver.hamburg.de / Andreas Vallbracht

汉堡 HAMBURG

Country:	Federal Republic of Germany
Official name:	Free and Hanseatic City of Hamburg
Geographical location:	53° 33′ N, 10 ° 0′ O
Area:	755,3 sq km
Population:	1.814.597 (2012/12/31)
Registered vehicles:	865.967 (2015)
Vehicle density per 1,000 inhabitants:	496
Number of electric vehicles:	approx. 2,500 (metropolitan area 2016)
Share of electric vehicles (total):	0.29%
Number of charging points:	approx. 600 slow charging points (in 295 places), 50 fast charging stations
CO_2-reduction target:	40% by 2020, 80% by 2050 (reference data from 1990)

Source: Own compilation with sources from hySOLUTIONS, hamburg.de and elektromobilitaethamburg.de

Country:	People's Republic of China
Official name:	Shenzhen Municipality
Geographical location:	22° 27′ N, 113° 46′ O
Area:	1.991,64 sq km
Population:	10,780,000 (stand: 31.12.2014)
Rolling stock:	3.300.000 (State: 31.11.2014)
Vehicle density per 1,000 inhabitants:	270
Number of electric vehicles:	78.200 (June 2017)
Share of electric vehicles (total):	2.34%
Number of electric charging sites:	approx. 50.000 slow charging points (in 580 locations) 1,800 fast charging stations
CO_2 reduction target:	40-45% by 2020 (reference data from 2005)

Source: Own compilation with sources from Lu (2016), State Council (2011) and english.sz.gov.cn

SHENZHEN
深圳

Photo: bayern-design.de

Photo: www.mediaserver.hamburg.de / Christian Spahrbier

02
SINO-GERMAN COOPERATION E-MOBILITY

Photo: Tuo Li

Photo: Tuo Li

Fegebank, Katharina (Deputy Mayor of the Free and Hanseatic City of Hamburg and Senator of the Department of Science, Research and Equalisation)

Birgitta Worringen (Deputy Director-General, Department Policy Issues, German Federal Ministry of Transport and Digital Infrastructure)

Photo: Tuo Li

2.1 Conference Introduction: Overview and expected outcomes

• Comparison of e-mobility development in China, Germany and leading European cities with regard to urban infrastructure and technology developments

Creation of general framework conditions:
• Outline of different policies and instruments for e-mobility promotion
• Illustration of technology challenges in the field of battery development
• Evaluation of international best practices on urban development

Electric mobility provides a strategic technological solution to the development of environmentally sustainable transport. Three demonstration regions for New Energy Vehicles (= e-mobility) in China funded by the Chinese Government (Ministry of Science and Technology by the People's Republic of China, MOST) as well as in Germany (funded by the German Federal Ministry of Transport and digital Infrastructure, BMVI) cooperate and compare experiences between the regions and cities of Shenzhen and Hamburg, Dalian and Rhine-Ruhr as well as Wuhan and Bremen-Oldenburg.

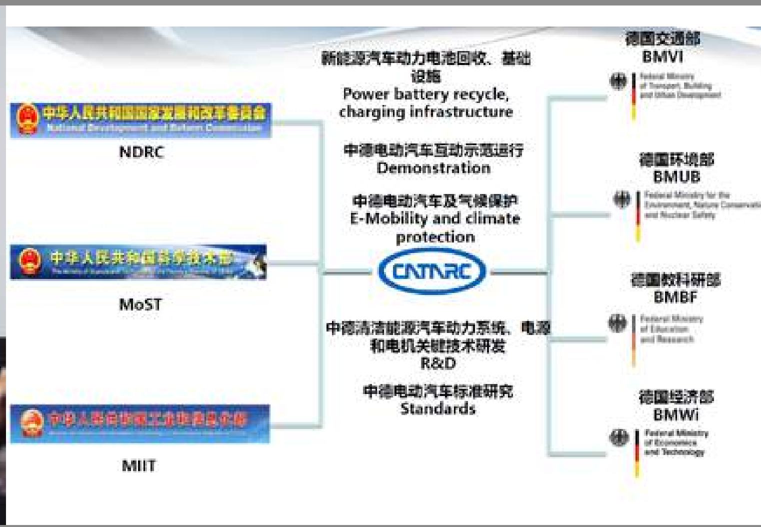
This emerging movement relies on the combination of public personal mobility services, such as car-sharing and a shift from fossil-based traffic towards electric vehicles. The aim of electric mobility is to not only change how people drive in the current system but also reduce traffic and start the transition towards a city of short distances.

Within the international cooperation, Hamburg invites the Chinese partners and experts from other European cities to introduce their concepts and lessons learned on implementing new energy vehicles in their regions and their specific policy framework. How can electro mobility contribute to sustainable urban development? Which instruments for promoting e-mobility are successful? And what are the challenges for future technological development? Using the example of these model regions and other international best practices, such questions will be discussed at HafenCity University's International Conference.

Mr. YIN (Counselor „Science and Technic“ of the Chinese Embassy in the Federal Republic of Germany, Ministry of Science and Technology of the People's Republic of China)

Dr.-Ing. Walter Pelka (President of HafenCity University Hamburg)

Photo: Tuo Li



Source: Wang (2016)

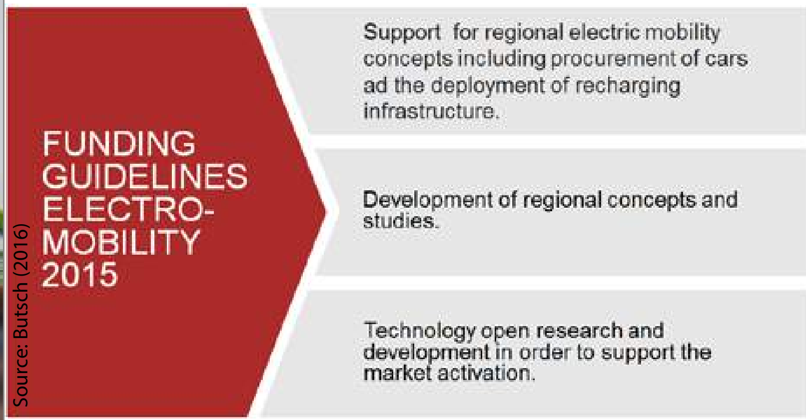
2.2 Sino-German Cooperation E-Mobility in China

Author
Name: WANG Cheng
Title: Deputy Director
Institution: China Automotive Technology & Research Center (CATARC)
Country: P.R. China

Summary:

The development of new energy vehicles (NEV) is a strategy measure of China to realize the sustainable automobile industry. Since the project of “Promoting NEVs in 10 cities, 1,000 units in each city” in 2009, China has issued supporting policies to promote the NEV industrialization. Various financial and tax incentive policies, as well as non-financial incentive measures were provided, which successfully helped the NEV market introduction. For example, there were the policies of “The notice of further conducting the pilot demonstration and promotion of energy saving and new energy vehicles” and the “Temporary regulations on providing pilot financial subsidies for private users who purchase NEVs”. The NEV products can get preferential taxes such as vehicle and vessel tax, and vehicle purchase tax. Besides, China supported the NEV scientific and research resources and funding through science and technology planning and projects, including the special key projects of EVs, the important projects of energy saving and new energy vehicles, and the technical innovation projects of NEV industry. Because the charging infrastructure is essential for NEV development, China issued several policies to support charging infrastructure construction and operation. With the national supporting policies system, the NEV demonstration cities also issued related local supporting policies to promote NEVs.

Photo: Tuo Li



Source: Butsch (2016)

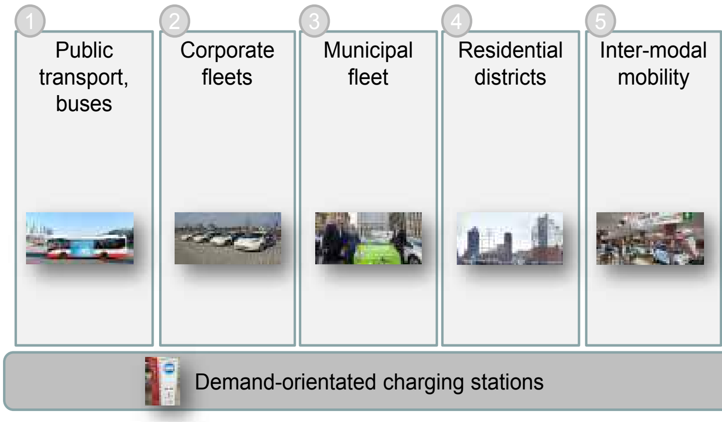
2.3 Sino-German Cooperation E-Mobility in Germany

Author
Name: Hanno Butsch
Title: Head of Division International Cooperation
Institution: National Organization Hydrogen- and Fuel Cell Technology (NOW) GmbH
Country: Germany

	STATE OF PLAY	OBJECTIVE FOR 2020
INFRA	▪ 6,517 publicly accessible normal recharging points ▪ Around 230 publicly accessible high power recharging points ▪ There are plans for around 1,400 high power recharging points	▪ 7,000 publicly accessible high power recharging points ▪ 36,000 additional publicly accessible normal recharging points
VEHICLES	▪ 37,951 electric vehicles ▪ 131,186 hybrid vehicles ▪ Among those >10,000 PHEVs (as of 01.01.2016)	▪ 1 million electrically powered vehicles

BUYER'S PREMIUM	RECHARGING INFRASTRUCTU RE	TAX PRIVILEGES	PUBLIC FLEETS
▪ Private and corporate customers will receive a premium of 4,000 € for BEV's and 3,000 € for PHEV's ▪ The premium is shared 50/50 between industry and government ▪ Funding only applicable for cars below 60,000 €. ▪ Total budget: 1.2 billion € until 2019	▪ Total budget: 300 Mio. € for infrastructure ▪ 200 Mio. € for AC stations and 100 Mio. € for DC stations ▪ 15,000 recharging stations shall be deployed (10,000 AC / 5,000 DC)	▪ No taxation on electric power for recharging at the workplace	▪ 20% electric vehicles in the federal government fleet by 2017 ▪ Overall investment costs of 100 Mio. €

Photo: Tuo Li



Source: Richter (2016)

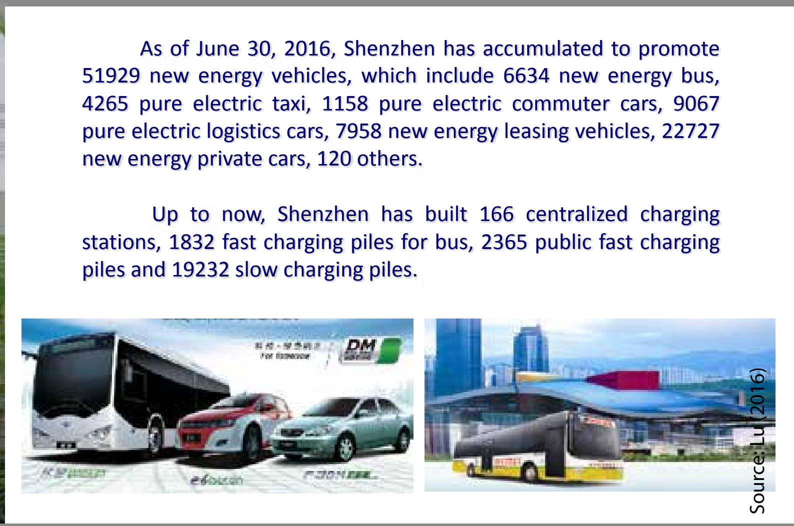
2.4 Policy overview for e-mobility promotion in Hamburg

Author
Name: Michael Richter
Title: Head of Division Innovation, Technology, Cluster
Institution: Ministry of Economy, Transport and Innovation, Free and Hanseatic City of Hamburg
Country: Germany

Summary:

For several years now, Hamburg operates successfully the development of electric mobility. Both in the number of battery-electric vehicles as well as the network of public accessible charging infrastructure, Hamburg is one of Germany's pioneers. According to the plans of the Federal Government, Germany is supposed to become the lead market and lead supplier for electric mobility. As innovation driver, electric mobility encourages the implementation of a new mobility culture, such as in public transport (especially via emission-free buses) or in covering short distances as part of inter-modal concepts and offers the potential to handle urban traffic on the whole more climate-friendly, cleaner and quieter. Beyond this, electric vehicles, as in industrial or municipal fleets, are making a significant contribution to achieve air pollution targets, to reduce the dependence on fossil fuels and therefore CO_2 emissions, and thus improving the quality of life in the urban area. Last but not least, a systematic integration of electric mobility in the planning concepts of urban and neighborhood developments offers the basis for a sustainable development of the city. Hamburg is known as strongly demand-oriented and, as an early market, provides a complementary approach to the various "Schaufenster Elektromobilität" which focus on the automotive industry locations. With the "Master plan Charging Infrastructure", adopted by the Hamburg Senate in 2014 and now being implemented, Hamburg creates the basis for a demand-oriented and balanced relationship between public accessible charging infrastructure and the successive rising EV traffic volumes. The important cornerstones of the master plan concept are an open market access for all interested operators, the offer of a wide, user-friendly access and a funding program for installations on private-commercial areas.

Photo: Tuo Li



Source: Lu (2016)

2.5 The progress report of the demonstration and promotion of new energy vehicles in Hamburg & Shenzhen

Author
Name: LU Xiangzhen
Title: Director
Institution: The Development and Reform Commission of Shenzhen Municipality
Country: P.R. China

Summary:

Since confirmed by MOST as a new energy vehicle demonstration and promotion partner with Hamburg in 2011, Shenzhen carried out a series of exchange activities with Hamburg. Both sides identified to develop exchanges and cooperation on three aspects, charging facilities planning, airport mobile equipment electrification, and cooperation of institutions. As of June 30, 2016, Shenzhen has accumulated to promote 51929 new energy vehicles, built 23429 charging piles. Shenzhen encourage the social forces on the construction and operation of new energy vehicles as well as their facilities, especially to make promotional breakthrough on the public service area as pure electric buses and logistics vehicles. The charging stations construction are based on drivers convenience with service radius as high as 0.85 km in downtown area. The airport shuttle trials are operated both in Shenzhen and Xiamen airport. The institutional co-operation got significant progress, the cross disciplinary collaborative platform will benefit Shenzhen's industrial development as well.

Photo: Tuo Li

03
BEST PRACTICES FROM CHINA AND GERMANY

Photo: Johannes Lauer

Photo: Tuo Li

Photo: Tuo Li

Photo: Tuo Li

3.1 Findings from project SINGER: Challenges for Technology and Urban Infrastructure Development

Managed by:

Prof. Dr.-Ing. Wolfgang Dickhaut (left image), Johannes Lauer (HafenCity University Hamburg)
Prof. Dr.-Ing. Karl-Ragmar Riemschneider (center image), Valentin Roscher (Hamburg University of Applied Sciences)
Prof. Dr. Michael Fröba (right image), Dr. Sebastian Kraas, Julia Ziegler (University Hamburg)

HCU / SDRC / SHENZHEN STAKEHOLDERS

Workpackage: E-Mobility & Urban Development
电动汽车与城市发展

1. Governance

Stakeholder and governance analysis
城市管理与政策分析

2. Evaluation

Evaluation E-Mobility in urban development projects
电动汽车在城市发展中的评价

3. International Conference

International Conference to exchange experiences
国际经验研讨会

UNI HH / HAW / PKUSZ

Workpackage: Technology
技术

1. Material quality standards

Material quality standards for lithium ion batteries
锂电池材料质量标准

2. Cathode materials

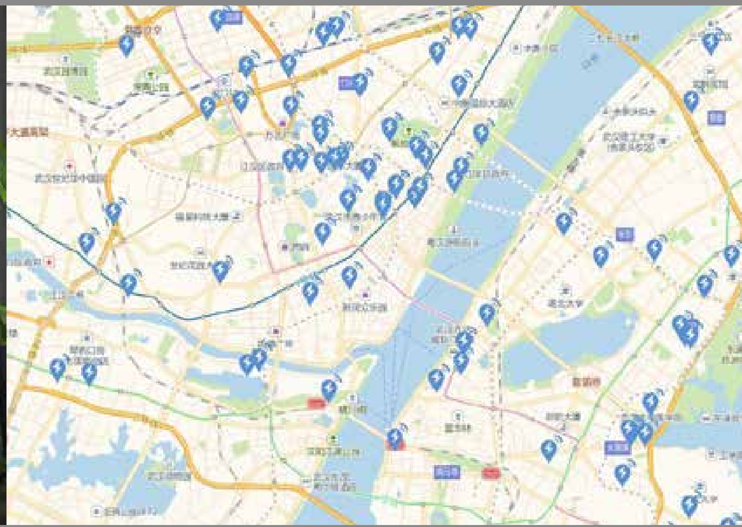
Advancement of cathode materials for fast charging
阴极材料对快速充电的先进性

3. Grid integration

Validation and grid integration
项目实施与电网整合

For more details please read the forthcoming final SINGER project reports.

Photo: Tuo Li


Source: Ma (2016)

3.2 Introduction to the promotion of new energy vehicles in Dalian

Presented by Prof. Dr. ZHOU Yafu

Author
Name: MA Chunyan
Title: Section Chief
Institution: The Leading Group Office of Energy Saving and New Energy Vehicles Demonstration Project in Dalian
Country: P.R. China

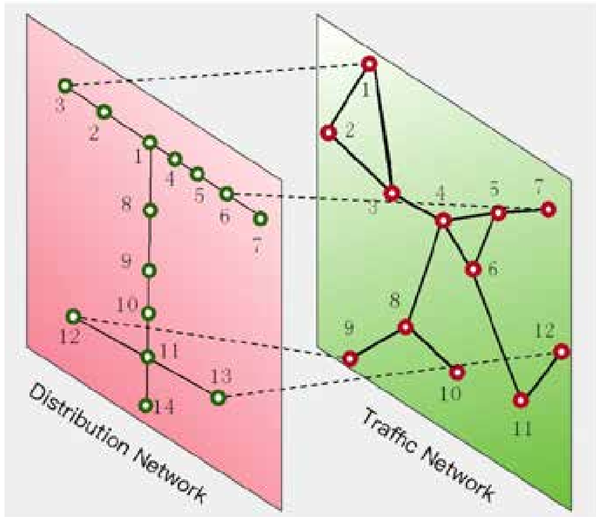
Co-Author: LI Weibin, Section Chief, The Leading Group Office of Energy Saving and New Energy Vehicles Demonstration Project in Dalian, P.R. China.

Summary:

Dalian, is one of 39 cities (regions) of new energy vehicles promotion from 2013 to 2015 in China. To arouse the enthusiasm of buying and using new energy vehicles, Dalian has taken measures to subsidize NEV buyers and not to perform traffic restriction. From 2013 to 2015, the city promotes more than 5200 new energy vehicles in the fields of buses, leasing, taxis and logistics. And 44 charging stations, 160 fast-charging piles and 2320 ordinary charging piles have been built at the same time. Dalian took the lead in proposing the goal of electric bus in the country and had 1700 new-energy buses with the construction of 26 charging stations. The leasing of NEV is also the key to the promotion of NEV in Dalian. There are more than 2600 new energy vehicles for the purpose of shuttle buses, tourist transportation, time sharing leasing, coaches and passenger cars. The shuttle bus leasing is the most popular one and it has more than 1700 cars with 15 charging stations and more than 300 fast-charging piles.

Photo: Tuo Li

Source: Zhang (2016)



3.3 Optimization of the charging station location for electric buses

Author
Name: ZHANG Kai
Title: Associate Professor
Institution: Graduate School at Shenzhen, Tsinghua University
Country: P.R. China

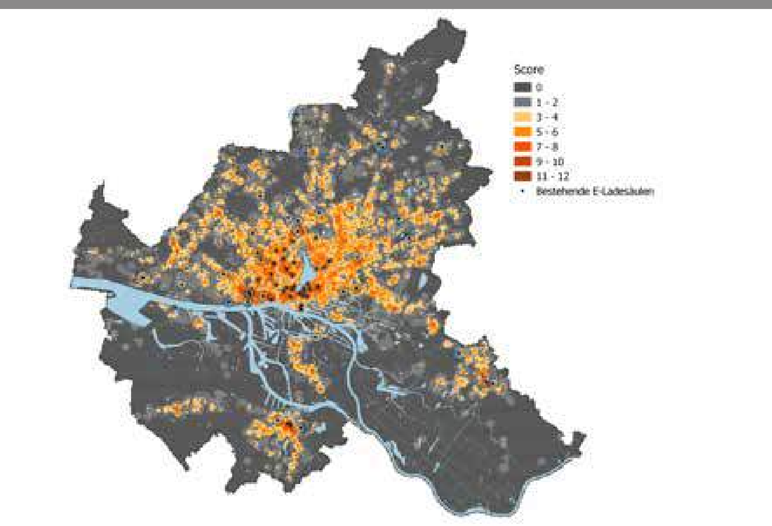
Co-Authors: Dr. ZHOU Zhe, Tshinghua-Berkeley Shenzhen Institute, China;
Associate Professor LI Zhiheng, Graduate School at Shenzhen, Tsinghua University, China

Summary:

Optimal planning of electric-bus charging stations is of great significance in the electrification of public transportation. Buses run on schedule and have high dependency on the reliability of power supply. Therefore, a multi-objective electric-bus charging station allocation model is established considering both electrical distribution and traffic network.

The bi-level model first considers the capturing traffic flow along bus lines and infrastructure investment in the traffic network and selects several feasible schemes by simulated annealing (SA) algorithm. Next, in the distribution network, the minimization of network losses and voltage deviation are taken as the objectives to obtain the optimal scheme without violating the voltage and power flow constraints. The bi-level planning model solves the coupled optimization of traffic and power system, and is capable of designing the emergency operation schedule. Finally, on the basis of a 14-node distribution network and 12-node traffic network, the effectiveness of the model is tested.

Photo: Tuo Li



Source: Scheler (2016)

3.4 „Finding the right location" - The development of a demand-oriented model to identify optimal locations for public e-charging infrastructure at the example of Hamburg

Author
Name: Christian Scheler
Title: M.Sc., mobility consultant
Institution: ARGUS - city and traffic planning
Country: Germany

Summary:

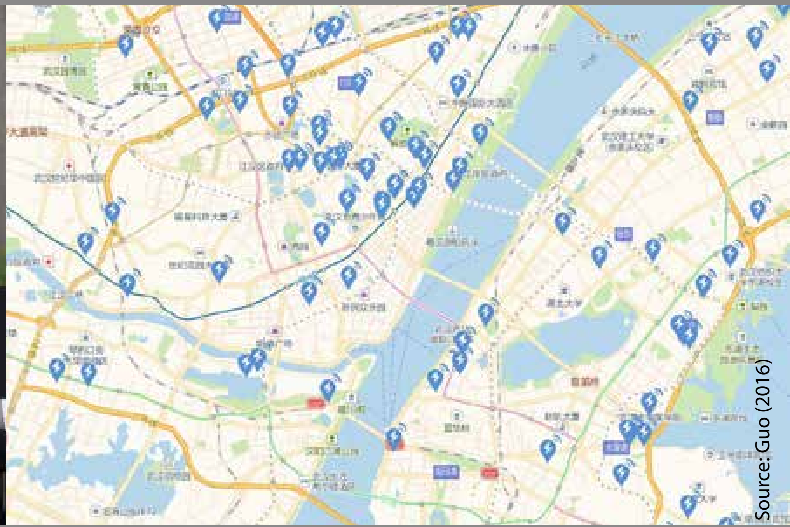
The electrification of cars is a new challenge for the "fuel" infrastructure in cities. To just rely on the loading infrastructure in private parking spaces or on petrol stations won't be successful. To support a successful establishment of e-mobility in cities it is important to understand the user demands connected to the different charging times. Even though a public loading infrastructure might not be necessary for most of driving patterns. A visible loading infrastructure could help to bridge the mental barrier of e-mobility by offering a possible range increase and hereby just a saver feeling driving a e-car. Furthermore, a well located public loading infrastructure is necessary to allow the electrification of free-floating car-sharing systems, such as car2go or DriveNow.

The master plan infrastructure points determents almost 600 additional charging points in Hamburg. In order to find the optimal locations, ARGUS was assigned to develop a location model in collaboration with the "Department of Economics, Traffic and Innovation" for the City of Hamburg and hySOLUTIONS.

According to current research, different aspects such as the residential and commercial density, the connection with public transport and the proximity to points of interest are taken into account. More than 8 factors are translated into a geographic information system that emits a map of the urban structure with its individual characteristics. Subsequently, the elevated potential locations are reviewed with a political perspective. As a last step, the locations are visited locally by experts from ARGUS so that the urban and traffic situation can be analyzed and the parking area can be measured and documented.

This location model allows to understand the predicted demand connected urban structure of the city apart from individual prejudice. Above that it gives a clear political argumentation for infrastructure placement and investment. In view of the availability of open data this location model is easily conferrable to other cities and can also be used to find suitable locations for other mobility services by adjusting the considered aspects.

Photo: Tuo Li


Source: Guo (2016)

3.5 New Energy Vehicles and Charging Infrastructure - Policies, Instruments and Development in Wuhan

Author
Name: GUO Liang
Title: General Manager
Institution: Wuhan Electric Vehicle Demonstration Co., Ltd
Country: P.R. China

Summary:

Wuhan is the biggest city in middle of China, gathering fourteen vehicles brands, six automobile factories. In 2003, it started “national electric vehicles demonstration city”. In 2009, the national “ten cities thousand vehicles” launched in Wuhan.

At present, the number of Wuhan New Energy Vehicles (NEV) has amounted to 15,567, and construction and running of total 4,982 charging piles. From 2013 to the first half of 2016,Wuhan adopted 29 NEV brands at home and abroad and 85 kinds of models. Vehicle type is mainly divided into pure electric vehicles and hybrid power vehicles. Wuhan NEV application areas include seven areas, such as bus, taxi, public, sanitation, logistics, commuting and social vehicles.

We have built the first batch of NEV safety monitoring data center in China, setting up charging alliance about city service and promoting interconnectivity about charging infrastructure. We are constructing public service management platform of city car- sharing, from network platform, ground platform and service platform, and providing a unified and standardized service to operators, government, vehicles enterprises and citizens. The data of all operators in the platform has shared resource of parking and charging pile because of interconnectivity.

In 2010, we signed a cooperation agreement with Nissan Corporation. As the first pilot city of Nissan LEAF pure electric vehicles, we have achieved the demonstration application, and have realized its production in China. In 2010, as the first pilot city of a Sino-German electric vehicles cooperation project, we have explored NEV marketing experience and data to exchange. The cooperation agreement of third period signed in 2015.

Photo: Tuo Li

Source: Garche (2016)

3.6 Overview Model Region E-Mobility RHINE-RUHR

Author
Name: Stefan Garche
Title: Lawyer
Institution: EE ENERGY ENGINEERS GmbH (Ener-gyAgency.NRW)
Country: Germany

Co-Author: Georg Grothues, head of regional project office model region Rhine-Ruhr, EE ENERGY ENGIN-NERS GmbH, grothues@energy-engineers.de

Summary:

Model Region for electromobility Rhine-Ruhr started 2009. Meanwhile 43 projects have been coordinated by the regional project office since 2009. A total budget of more than 53 Mio. EUR (with a funding budget of more than 33 Mio. EUR) cover 90 project partner. Over 900 vehicles are planned in total and more than 440 are already in use. Around 1.000 charging points were planned and appr. 400 are installed.

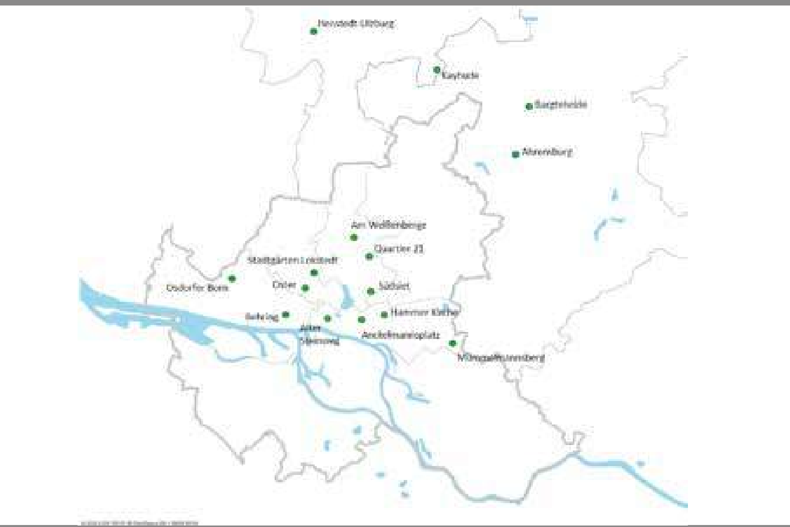
The focus is on commercial and municipal fleets, public transport (inter-modality), development of business models, international cooperations and integration of renewable energies. During the presentation the targets of each project as well as some results will be presented. Also an outlook for the planned next phase until 2019 will be given.

Photo: Johannes Lauer

04
INTERNATIONAL EXPERIENCE: URBAN INFRASTRUCTURE

Photo: Tuo Li

Photo: Tuo Li



Source: Kulus/Prill

Photo: Tuo Li

4.1 Smart e-mobility solutions for residential areas in Hamburg - e-Quartier Hamburg - experiences

Authors
Name: Dipl.-Ing. Daniel Kulus and Dr. Thomas Prill
Institution: HafenCity University Hamburg
Country: Germany

Co-Author: Prof. Dr.-Ing. Wolfgang Dickhaut,
HafenCity University Hamburg (HCU), Germany,

Summary:

Facing the increasing traffic load, innovative mobility concepts are needed to improve the quality of life in residential areas. The goals of the transformation process are traffic avoidance and environmentally friendly transportation systems with renewable energy sources. There are two important solutions for the climate- and city-friendly mobility: car sharing and electromobility. On the long term, car sharing can influence the mobility behavior and help to reduce the number of vehicles in the streets, what makes a city more livable. “e-Quartier Hamburg” is a project funded by the BMVI (Federal Ministry of Transport and Digital Infrastructure) as a part of the program “Modellregionen für Elektromobilität”. The aim of the project is the development and implementation of e-car sharing concepts in 10 residential areas in the city of Hamburg including new developing and existing neighborhoods. The HafenCity University (HCU) accompanies the project regarding the evaluation of the locations, the implementation process, the urban integration and the user acceptance of the concepts. Further research topics are use cases and business models for e-car sharing in residential development and the integration of electric vehicles in existing energy systems. We like to present results and experiences from the ongoing project.

The HCU furthermore has set up a body that provides mobility management and mobility consulting at five “e-Quartier”-sites. This body’s tasks include support of the car sharing providers in terms of acquiring new customers and therefore research participants through information and communication. It also contains promoting sustainable mobility in general by focusing not only on car sharing but by considering the whole spectrum of available transport means as well as local supply options. We will use our presentation to give an outlook on the elements of mobility management for the project “e-Quartier” and the way it will be executed. The discussion, which will follow our speech, can be used to take a critical view on our findings and prospects.

Photo: Tuo Li

Source: ZERAuto (http://zerauto.nl/wp-content/uploads/2016/12/car2go-amsterdam-1152x720.jpg)

4.2 E-Mobility at Metropolitan Region Amsterdam - Electric (MRA-E)

Presented by
Name: Maarten Linnenkamp
Country: Netherlands

Source: Linnenkamp (2016)

Photo: Tuo Li


Source: de Jong (2016)

4.3 Explaining success and failure in Sino-European collaboration: Drawling lessons from Shenzhen International Low Carbon City

Author
Name: W. Martin de Jong
Title: Antoni van Leeuwenhoek professor in urban and infrastructure development in China
Institution: Delft University of Technology
Country: The Netherlands

Summary:

In the wake of global climate change and strengthening links between the EU and China on sustainable urbanization, a considerable number of collaborative projects have been undertaken. The success of and satisfaction with these projects depend of good vision, promising content and complementarity of needs, but also on good understanding of administrative and cultural differences. Which bottlenecks exist in Sino-European collaboration and what
possibilities are there to deal with them? This contribution highlights the key issues in complications as they emerge in Sino-European interaction on sustainable urbanization and offers ways of dealing with them, partly based on the author's personal experience in developing Shenzhen International (former known as 'Sino-Dutch') Low Carbon City.

Photo: Tuo Li


Source: BMW

4.4 Copenhagen's road to carbon neutral transport

Author
Name: Kasper Brenøe Isbrand
Title: E-mobility Coordinator
Institution: The City of Copenhagen, the Technical and Environmental Administration
Country: Denmark

Co-Author: Birte Busch Thomsen, the City of Copenhagen, the Technical and Environmental Administration

Summary:
The City of Copenhagen has set a goal to be the first carbon neutral capital in the World in 2025. The road to carbon neutrality is an ambitious plan requiring long-term action, but it is realistic. In the transport sector initiatives include:

- Considerable investments in bicycle infrastructure and public transport
- Supporting Car Sharing, EVs in particular: 850 electric car sharing vehicles will run in Copenhagen by the end of 2016
- Replacing ALL City Administration vehicles with vehicles on new fuels
- Electric buses
- Developing a public infrastructure for EV charging: 500 charging spot established so far
- Green Taxis: Working with the taxi business to go carbon neutral
- Developing mobility projects to help citizens and companies chose green transport, e.g. Mobility As A Service
- Carbon Neutral cargo delivery
- Converting heavy vehicles to biogas and other new fuels
- Improving the political framework to support carbon neutral vehicles in general

Mobility initiatives are responsible for 10 percent of the total reduction.

Photo: Tuo Li

Source: Lauer (2016)

4.5 E-Mobility and Urban Development in Hamburg and Shenzhen

Author
Name: Johannes Lauer
Title: Dipl.-Geogr.
Institution: HafenCity University Hamburg
Country: Germany

Co-Author: Prof. Dr.-Ing. Wolfgang Dickhaut, HafenCity University Hamburg (HCU), Germany

Summary:

Hamburg and Shenzhen combine similar spatial scales with different requirements for promoting New Energy Vehicles (NEVs). With China's leading NEV producer BYD, Shenzhen has set up a good policy environment for industry development. Hamburg is a leading city for NEV development in Germany, but in terms of the sheer number of vehicles, Shenzhen seems to be acting faster than Germany's second-largest city. By the end of 2015, just 0.6 % of vehicles in Hamburg (1.8 Million inhabitants) were electrified (1,100 NEVs, 600 public slow charging points, 50 fast charging points). The "low carbon city" Shenzhen (more than 11 Million inhabitants) promoted up to 52,000 NEVs with 50,000 slow charging points and up to 1,800 fast charging points. This is a total share of 1.57 % of registered vehicles of Shenzhen Municipality. Both cities have strong targets for CO2-reduction. Hamburg hopes/plans to reduce CO2 by 40% by 2020 and 80% by 2050 (with reference data from 1990). Shenzhen set low-carbon targets with a 40-45% reduction by 2020 (reference data from 2005).

Both city governments set up strong policies with the help of planning and economic instruments to promote e-mobility. Hamburg identified four fields of key-activities: E-mobility solutions for economic transportation, multi-modal urban mobility concepts, the integration of NEVs into public transport and the construction of inner-city charging infrastructure. With 5 billion Yuan (804 million USD), Shenzhen has prioritized the electrification of public transport systems - especially for bus and taxi fleets. Comprehensive solutions have been adopted in several low-carbon city projects that prioritize Transit-Oriented Development (TOD) strategies. This is combined by the strong development of pubic charging stations, mainly for economic fleets. Like in Hamburg, promotion for private users will be the last and most difficult step.

While Shenzhen governs with hard sanctions for fuel car number plates and very high buy-incentives for NEV-users, Hamburg has set up softer incentives like the promotion for company fleets to use NEVs, better parking regulations, or a better environment for e-car-sharing services. The challenge in Hamburg and Shenzhen is to encourage citizens to use NEVs while finding the balance between economic development and environmental protection.

Photo: Tuo Li

Source: Pomränke (2016)

4.6 The Qianhai Transportation Hub Urban Development Project

Author
Name: Nicolas Pomränke
Title: Dipl.-Ing. Architekt, Associate Partner
Institution: gmp · Architekten von Gerkan, Marg und Partner
Country: Germany

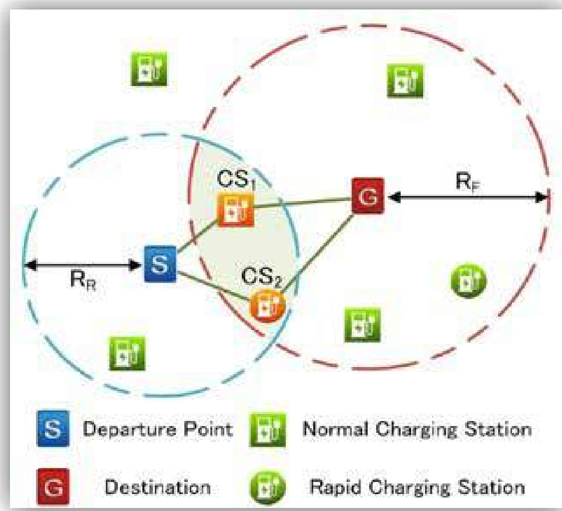
Summary:

The Qianhai district is an urban extension of the city of Shenzhen, which is one of the most important cities in the Pearl River Delta and whole China. Its economic power generates a constant growth, which lets the city reach as well its natural (sea and mountains), as its political borders (Hong Kong), which is why the Qianhai district has been gained by land reclamation from the Qianhai bay. Its strategic asset is the closeness to Hong Kong and Guangzhou, which will be linked by a high-speed train stopping at the Qianhai Traffic Hub. The Hub will connect a long distance train, a rapid transit system and several metro lines and thus offer an exceptional public transport system, which will be the main means of transportation for the whole quarter.

These conditions have an important impact on the possibilities of urban design. As most people will arrive by public transport and the complete service traffic is handled underground, the street level is strongly relieved from vehicular traffic. These free spaces offer the chance to rethink an urban quarter in terms of expanding the public realm and reclaiming livable urban spaces, which have been occupied by cars before.

The design for the Qianhai Hub Project tries to expand the public space in all three dimensions while offering excellent connectivity at the same time. Although large shares of the expected traffic is still based on fuel powered individual traffic, the intention to regain the public space for the citizens can be considered as a general strategy for the future changes of our transportation systems.

Photo: Tuo Li



Source: Li (2016)

4.7 Influence of EVs and Smart Transportation

Presented by Dr. ZHANG Kai

Author
Name: LI Zhiheng
Title: Associate Professor
Institution: Graduate School at Shenzhen, Tsinghua University
Country: China

Co-Author: Associate Professor Kai Zhang, Graduate School at Shenzhen, Tsinghua University, China

Summary:

EVs have lot of benefits to developing country, such as reduction of carbon emissions (almost no carbon emission to Metropolis), high energy efficiency (especially in the case of low speed on Urban Roads), and diversification of fuel supply. However, several factors limit the popularity of EVs, range Anxiety, lack of Intelligent Sharing Service, etc. On the other hand, ITS can help narrow the limitation, such as charging facilities planning based on Transportation Big Data Processing, and intelligent charging route guidance based on LBS service and Telematics.

The presentation is organized as follows. The limitation of EVs is introduced, and then the relation between EVs and ITS is discussed, especially the solution of EV Range Anxiety and the solution of EV Sharing Service under ITS context. Finally how to evaluate EVs influence on ITS is introduced.

Photo: Tuo Li

Photos: Minnich (2016)

4.8 Electric cars in company and car-sharing fleets in German cities

Author
Name: Lukas Minnich
Title: Dipl.-Ing.
Institution: Öko-Institut e.V.
Country: Germany

Co-Author: Dr. Friederike Hülsmann, Öko-Institut e.V., Germany

Summary:

Several German cities such as Hamburg and Stuttgart are obligated by EU directives to significantly reduce immissions of NOx and particle matter in the short term. At the same time, climate change abatement targets demand decarbonisation of the transportation sector until 2050. It is obvious that there is no exclusive solution for these challenges. One approach is to replace fossil fuels and switch to alternative drive trains such as e-mobility. However, necessary changes do not stop at the technological level. More flexible and demand-driven means of transport have to be introduced in order to substitute private car use by multi-modal mobility patterns. Unlike in rapidly growing and developing economies such as China, in Germany these new concepts can nowadays hardly ever be designed from scratch. Introducing these new technologies and behaviors into long-established urban structures and consumer habits is an entirely different challenge. In the "ePowered Fleets Hamburg" project, funded by the German Federal Ministry for the Environment, Oeko-Insitut analyses deployment patterns of more than 400 electric vehicles and user attitudes of over 250 companies in Hamburg region over three years. First evidence shows that some companies are enthusiastic about achieving 100% e-mobility as fast possible. They strive for extensive use and full integration of electric cars in their fleet. Yet, findings for most companies taking part in the project show that restrictions for conventional vehicles and additional privileges for electric cars will be necessary so that they opt for further electrification of their fleet. In the "share" project funded by the German Federal Ministry for the Environment, the research partners Oeko-Institut and the Institute for Social-Ecological Research in collaboration with car2go analyses the users of one-way car-sharing by applying an online panel survey over two years in Stuttgart, Cologne and Frankfurt. Socioeconomic characteristics, basic lifestyle, acceptance and attractiveness of electric versus conventional cars with conventional combustion engines and mobility behavior are explored. First results show that electric and conventional cars are perceived similarly useful, comfortable and reliable. Users of one-way car-sharing are mostly young, high educated people with a high affinity to information and communication technologies. They show a multi-modal mobility using more different means of transportation than the average population in the cities studied.

In both cases, preliminary project results give some first hints about which policies can give incentives for widespread use of the new mobility options and how emissions abatement can be optimized.

Photo: Tuo Li

Photos: Stromnetz Hamburg

4.9 Public charging infrastructure in Hamburg

Presented by
Name: Stefan Zisler
Institution: Stromnetz Hamburg GmbH
Country: Germany

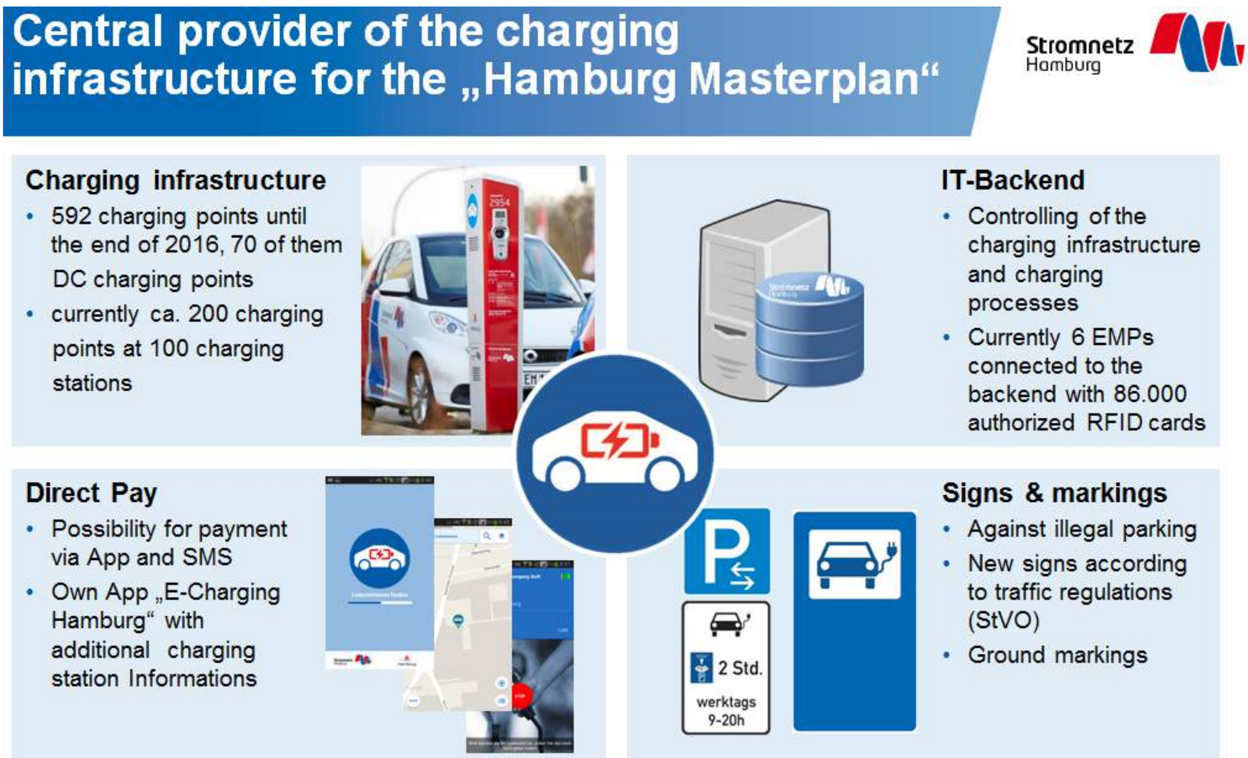


Photo: Tuo Li

4.10 Panel discussion and questions with international experts

Panelists

- LU Xiangzhen (Shenzhen Development and Reform Commission)
- MA Chunyan (Dalian City Energy Conversation Technology Service Center)
- GUO Liang (Wuhan EV demonstration Co. Ltd.)
- XU Wenxia (Tongji University Shanghai)
- Lindlahr, Peter (Hamburg, hySOLUTIONS GmbH)
- Dr. Rausch, Gerald (Fraunhofer IFAM, Bremen-Oldenburg)
- Dr. Köster, Frank (EnergieAgentur.NRW, Rhein-Ruhr)

Moderation: Heinrich Klingenberg, hySOLUTIONS GmbH
Interpreter: Hanan Wang

Entry question to all panel members/opening question to all panelists:

- What is the political importance of electromobility in its respective regions?
- Which focal points you place in this process and which may differ from other regions?
- And which fields of application (public transport, logistics, etc.) You want to activate next?

Photo: Johannes Lauer

05
WORKSHOPS: URBAN INFRASTRUCTURE DEVELOPMENT

Photo: Tuo Li

Photo: Tuo Li

Photo: Tuo Li

Workshops on international experience from Shenzhen, Copenhagen and e-Carsharing

Group discussions, evaluation and joint development of suitable instruments for local governments and stakeholders

Minutes for Shenzhen, Copenhagen and E-Carsharing:

5.1 Case study: SHENZHEN

ILCC: Success or failure? Grows slower than expected, Far away from center, early stage, remain small if companies not come, government improves, real estate slowed down Status quo of ILCC: SZ Gov. will achieve their goals => time, transport will be successful / Line 1 is finished, No problem in planning => reality?, Fewer parking space is no problem for overall planning but with local residents => Government push them to use public transport.

Involvement of other institutions: GDP important => investments => foreigners welcome, NL cooperation: Environmentally Sound industrial area: Garbage treatment, Pingdi large area 53 km2 => ILCC just 2 km2 => attract companies and residents

Integration of e-Mobility? Increase frequency => build subways / e-Trams, All buses will be e-Buses (more buses / more lines), New community complex => use cars less frequently, Problem: Lend belongs to residents => Government wants to use it => Shenzhen has enough money to shift rural to urban land, Now it is not easy to reclaim land from local residents like in earlier times, SZ Government don't want to push residents out, Residents has other interests than government, Hakka culture implementation? Rural people => Meizhou (Huizhou?), SZ is 100 % urbanized.

Charging infrastructure, 2013 planning => how many implement => demand / estimation, Method for integration from urban development, Tianjin Eco-city is similar to ILCC, Success: not specific / copy demonstration mode from Tianjin, "Transplant ability", Objectives change => Adaptation, Goals change => ?, Phases of development will fulfilled, E-Bus/E-Taxi all implemented until 2020, SZ has enough funding to fulfill the targets of the SMART Model, Transportation, Industry, Housing, Environment, Air pollution national goals, E-Mobility just one part of Low Carbon development, SDRC => ILCC, Air pollution: Environmental Department responsible, Coordination mechanism under head of SDRC, Copenhagen as = Shenzhen: Air pollution reduction plan => Low Carbon Plan, Documents will go to different ministry levels on the municipal level, Goals from national level or higher have to be implemented

Photo: Tuo Li

Photo: Tuo Li

5.2 Case study: COPENHAGEN

Current national government set guidelines which do not comply with the ambitious goals Copenhagen has set on a municipal level (Carbon-neutrality to be achieved by 2025)

E-mobility is #4 in the priorities for the development of transport and mobility_ #1 is cycling, #2 public transport #3 is what?

Charging infrastructure is provided by private companies (better place). These apply for permits to realize charging points in certain locations. Municipality grants permits according to certain parameters – no competition in private sector as in Shenzhen, but neither realized by public sector as in FHH

Multi-modality hubs are being planned, where all modes are accessible. "One card for all" is being established, which provides access to public transport but also bike- and car sharing systems.

Station based car sharing is being subsidized, as the effect of a reduction of privately owned vehicles is proven. With free floating systems this is not yet the case. CPH therefore tries to implement a 5-year trial period, where the medium-term effects of free floating systems on car ownership are being analyzed.

Currently station based CS preferred in parking allocation

New developments are seen as most important and promising in changing peoples' mobility pattern, as moving often happens in times of change in the personal situation and come with more openness towards new ideas. BUT: CPH has a fixed quota as to how many parking spaces have to be provided in new developments – this is no longer the case in Germany, where it is now possible to create actual car free neighborhoods.

5.3 Case study: E-CARSHARING

-Free floating and station based systems can and should complement one another

-How can car sharing be implemented in a society where car ownership is ranking high as a status symbol?

-Potential of station-based one-way cars sharing, where vehicles can be rented at one station and returned at another (as in StadtRad Hamburg)?

-Can reserved parking spaces for car sharing vehicles reduce car ownership, as the number of parking spaces for conventional privately owned vehicles is being reduced? Or does this motivate more people to drive instead of using public transport, if the availability of parking makes driving (a car sharing vehicle) easier?

-Private and intra-business car sharing as a potential: smart systems to share private cars (reservation, co-ordination, cost); option for employees to use vehicle of a commercial fleet after hours and on weekends can reduce the need to own a private vehicle

-Intercity station based car sharing

-In cities with high proportions of cyclists and public transport, are BEV feasible as a substitute for privately owned conventional vehicles? Copenhagen: many trips are done by bicycle and public transport, cars are often used for longer distances e.g. weekend trips, which cannot be done by either of the other means of transport. Currently available BEVs cannot fulfill the need of these users as the demanded range cannot be guaranteed.


Photo: Tuo Li

06
ATTACHMENT

International Conference

E-Mobility: Challenges for Technology and Urban Infrastructure Development

Conference Language: 1st day: Chinese-German (with simultaneous interpreters); 2nd day: Chinese-English (with simultaneous interpreters); 3rd (excursion-)day: English (Chinese supported).
This conference is part of the Sino-German Electromobility Research (SINGER) project.

Overview

- Comparison of e-mobility development in China, Germany and leading european cities with regard to urban infrastructure and technology developments

Creation of general framework conditions:

- Outline of different policies and instruments for e-mobility promotion
- Illustration of technology challenges in the field of battery development
- Evaluation of international best practises on urban development

Expected Outcomes

Electric mobility provides a strategic technological solution to the development of environmentally sustainable transport. Three demonstration regions for New Energy Vehicles (= e-mobility) in China funded by the Chinese Government (Ministry of Science and Technology by the People's Republic of China, MOST) as well as in Germany (funded by the German Federal Ministry of Transport and digital Infrastructure, BMVI) cooperate and compare experiences between the regions and cities of Shenzhen and Hamburg, Dalian and Rhein-Ruhr as well as Wuhan and Bremen-Oldenburg.

This emerging movement relies on the combination of public personal mobility services, such as carsharing and a shift from fossil-based traffic towards electric vehicles. The aim of electric mobility is to not only change how people drive in the current system but also reduce traffic and start the transition towards a city of short distances.

Within the international cooperation, Hamburg invites the Chinese partners and experts from other European cities to introduce their concepts and lessons learnt on implementing new energy vehicles in their regions and their specific policy framework. *How can electro mobility contribute to sustainable urban development? Which instruments for promoting e-mobility are successful? And what are the challenges for future technological development?* Using the example of these model regions and other international best practices, such questions will be discussed at HafenCity University's International Conference.

Day before conference (optional)

Monday, 26th of September (Start 14:00 pm at exit, U4 Station „Überseequartier"):

- **Stromnetz Infotainer (14:00 pm).** Venue: San-Francisco-Straße, Hamburg
- **HafenCity sightseeing tour (14:30 pm).** Venue: Osakaallee 9, 20457 Hamburg

International Conference

E-Mobility: Challenges for Technology and Urban Infrastructure Development

supported by:

Part One - Tuesday, 27th of September 2016 (Language: Chinese-German)

Module 0: Introductions, policies and experiences

09:00	(0.1)	**Welcome address: HafenCity University and Hamburg City**
	▸	Dr.-Ing. Walter Pelka (President of HafenCity University Hamburg)
	▸	Fegebank, Katharina (Deputy Mayor of the Free and Hanseatic City of Hamburg and Senator of the Department of Science, Research and Equalisation)
09:20	(0.2)	**Welcome address: China and Germany**
	▸	CHEN Jiachang (Deputy Director Division International Cooperation, Ministry of Science and Technology of the People's Republic of China)
	▸	Birgitta Worringen (Deputy Director-General, Department Policy Issues, German Federal Ministry of Transport and Digital Infrastructure)
09:50	(0.3)	**Introduction and programme overview**
	▸	Moderation: Prof. Dr.-Ing. Wolfgang Dickhaut (HafenCity University Hamburg)

Module 1: Sino-German Cooperation E-Mobility

10:00	(1.1)	**Sino-German Cooperation E-Mobility in Germany**
	▸	Dr. Hanno Butsch (National Organisation Hydrogen and Fuel Cell Technology, NOW GmbH)
10:30	(1.2)	**Sino-German Cooperation E-Mobility in China**
	▸	WANG Cheng (China Automotive Technology and Research Center, CATARC, Deputy Director Beijing Operations)
11:00		Coffee and tea break
11:30	(1.3)	**Policy overview for e-mobility promotion in Hamburg**
	▸	Andreas Richter (Ministry of Economy, Transport and Innovation Free and Hanseatic City of Hamburg, Head of Division Innovation, Technology, Cluster)
12:00	(1.4)	**The progress report of the demonstration and promotion of new energy vehicles in Hamburg & Shenzhen**
	▸	LU Xiangzhen (The Development and Reform Commission of Shenzhen Municipality, Director)
12:30		Lunch break

Module 2: Best practices from China and Germany

13:30	(2.1)	**Findings from Project SINGER: Challenges for Technology- and Urban Infrastructure Development in Hamburg and Shenzhen**
	▸	Johannes Lauer (HafenCity University Hamburg)
	▸	Prof. Dr. Michael Fröba (University Hamburg)
	▸	Valentin Roscher (University of Applied Sciences Hamburg)
	(2.2a)	**Insights into China's and Germany's NEV demonstration regions**
14:15	▸	**Shenzhen: Optimization of the charging station location for electric buses,** Dr. ZHANG Kai (Associate Professor, Division of Logistics and Transportation, Tsinghua University, Graduate School at Shenzhen)
14:40	▸	**Hamburg: „Finding the right location"** Christian Scheler (ARGUS - city and traffic planning)
15:00		Coffee and tea break
	(2.2b)	**Insights into China's and Germany's NEV demonstration regions**
15:30	▸	**Introduction to the promotion of new energy vehicles in Dalian,** Prof. Dr. ZHOU Yafu (Dalian University of Technology)
15:50	▸	**Rhein-Ruhr: Overview Model Region E-Mobility RHINE-RUHR** Dr. Stefan Garche (EnergieAgentur.NRW)
16:10	▸	**New Energy Vehicles and Charging Infrastructure - Policies, Instruments and Development in Wuhan,** GUO Liang (Wuhan EV demonstration Co., Ltd.)
16:30	(2.3)	**Panel discussion and questions with international experts**
	▸	Moderation: Klingenberg, Heinrich (Managing Director, hySOLUTIONS GmbH)
	▸	**Shenzhen:** LU Xiangzhen (SDRC)
	▸	**Dalian:** Prof. Dr. ZHOU Yafu (Dalian University of Technology)
	▸	**Wuhan:** GUO Liang (Wuhan EV demonstration Co., Ltd.)
	▸	**Shanghai:** XU Wenxia (Tongji University Shanghai)
	▸	**Hamburg:** Peter Lindlahr (hySOLUTIONS GmbH)
	▸	**Bremen-Oldenburg:** Dr. Gerald Rausch (FRAUNHOFER IFAM)
	▸	**Rhein-Ruhr:** Dr. Frank Köster (EnergieAgentur.NRW)
	▸	***Poster presentations from Bremen-Oldenburg, Rhein-Ruhr, Hamburg and specific e-mobility projects***
18:00		Evening event: Dinner and get-together at HCU-Café

International Conference

E-Mobility: Challenges for Technology and Urban Infrastructure Development

supported by:

Part Two - Wednesday, 28th of September 2016 (Language: English-Chinese)

Module 3a: International experience in urban infrastructure

09:00	(3.1)	**Smart e-mobility solutions for residential areas in Hamburg - e-Quartier Hamburg - experiences**
	▸	Daniel Kulus and Dr. Thomas Prill (HafenCity University Hamburg)
09:30	(3.2)	**Explaining success and failure in Sino-European collaboration: Drawling lessons from Shenzhen International Low Carbon City**
	▸	Prof. Dr. W. Martin de Jong (TU Delft)
10:00	(3.3)	**E-Mobility at Metropolitan Region Amsterdam - Electric (MRA-E)**
	▸	Maarten Linnenkamp (Metropolitan Region Amsterdam – Electric (MRA-E), Project Manager)
10:30		Coffee and tea break
11:00	(3.4)	**Copenhagen's road to carbon neutral transport**
	▸	Kasper Brenøe Isbrand (City of Copenhagen, Technical and Environmental Department)
11:30	(3.5)	**Workshop 3a: International experience from Hamburg, Shenzhen, Amsterdam and Copenhagen**
	▸	Moderation: Prof. Dr.-Ing. Wolfgang Dickhaut (HafenCity University Hamburg)
	▸	Group discussion, evaluation and joint development of suitable instruments for local governments and stakeholders
12:30		Lunch break

Module 3b: Urban infrastructure challenges at the project level

13:30	(3.6)	**E-Mobility and Urban Development in Hamburg and Shenzhen**
	▸	Johannes Lauer (HafenCity University Hamburg)
13:55	(3.7)	**The Qianhai Transportation Hub Urban Development Project**
	▸	Nicolas Pomränke (Associate Partner, GMP - von Gerkan, Marg and Partners Architects)
14:20	(3.8)	**Influence of EVs and Smart Transportation**
	▸	Dr. LI Zhiheng (Tsinghua University, Graduate School at Shenzhen)
14:45		Coffee and tea break
15:15	(3.9)	**Electric cars in company and carsharing fleets in German cities**
	▸	Lukas Minnich (Öko-Institut e.V.)
15:35	(3.10)	**Public charging infrastructure in Hamburg**
	▸	Stefan Zisler and Thomas Börger (Innovation Management, Stromnetz Hamburg GmbH)
15:55	(3.11)	**Workshop 3b: Integration of charging infrastructure, e-Carsharing, and urban development on project level**
	▸	Moderation: Prof. Dr.-Ing. Wolfgang Dickhaut (HafenCity University Hamburg)
	▸	Group discussion on different urban development approaches
	▸	Evaluation of best practices to integrate charging infrastructure and sustainable mobility in existing and new urban development projects
17:00		Excursion: Joint walk to Stromnetz Infotainer and Hydrogen Tank Stop
17:20	(5.1)	**Visit of Stromnetz Infotainer and Hydrogen Tank Stop at HafenCity**
	▸	Guided by Stromnetz Hamburg and Vattenfall Europe Innovation
		Address: San-Francisco-Straße 1 and Ericusspitze, 20457 Hamburg
19:00		Free evening / dinners can be organized by individual groups

International Conference

E-Mobility: Challenges for Technology and Urban Infrastructure Development

hy SOLUTIONS · HCU HafenCity Universität Hamburg · Hochschule für Angewandte Wissenschaften Hamburg · Universität Hamburg

Federal Ministry of Transport and Digital Infrastructure · supported by: NOW · Modellregionen Elektromobilität · Wasserstoff-Gesellschaft Hamburg e.V.

Part Two - Wednesday, 28th of September 2016 (Language: English; Chinese supported)

Module 4a: Workshop Technology (Part 1)

09:00	(4.1)	**Built-in wireless cell sensors, optical cell sensors and decentralized signal processing for precise cell state estimation** ▸ Prof. Dr.-Ing. Karl-Ragmar Riemschneider (Hamburg University of Applied Sciences)
09:30	(4.2)	**Modeling Li-ion batteries for state-of-charge, state-of-health and temperature indication** ▸ Dr. Dimitri Danilov (Forschungszentrum Jülich / Eindhoven University of Technology)
10:00	(4.3)	**General requirements and challenges for battery management in EV** ▸ Prof. Dr. Ghanim Putrus (Northumbria University, Newcastle)
10:30		Coffee and tea break
11:00	(4.4)	**Customised Lithium Cell Solutions** ▸ Torge Thönnessen (Custom Cells Itzehoe GmbH)
11:30	(4.5)	**Workshop 4a: Group discussion on the integration of advanced battery models in battery management systems, hardware presentation** ▸ Moderation: Prof. Karl-Ragmar Riemschneider (University of Applied Sciences Hamburg)
12:30		**Lunch break**

Module 4b: Workshop Technology (Part 2)

13:30	(4.6)	**Different generations of Lithium based batteries in the field of EV** ▸ Prof. Dr. Michael Fröba (University Hamburg)
14:00	(4.7)	**The progress report on the research of power battery materials at PKUSZ** ▸ Dr. LIU Yidong (Peking University Shenzhen Graduate School, School of Advanced Materials, Researcher)
14:30	(4.8)	**Requirements of a cathode material used for fast-charging** ▸ Dr. Sebastian Kraas (University Hamburg)
15:00		Coffee and tea break
15:30	(4.9)	**Workshop 4b: Group discussion on advanced battery materials** ▸ Moderation: Prof. Dr. Michael Fröba (University Hamburg)
17:00		**Excursion: Joint walk to Stromnetz Infotainer and Hydrogen Tank Stop**
17:20	(5.1)	**Visit of Stromnetz Infotainer and Hydrogen Tank Stop at HafenCity** ▸ Guided by Stromnetz Hamburg and Vattenfall Europe Innovation Address: San-Francisco-Straße 1 and Ericusspitze, 20457 Hamburg
19:00		**Free evening / dinners can be organized by individual groups**

International Conference

E-Mobility: Challenges for Technology and Urban Infrastructure Development

hy SOLUTIONS · HCU HafenCity Universität Hamburg · Hochschule für Angewandte Wissenschaften Hamburg · Universität Hamburg

Federal Ministry of Transport and Digital Infrastructure · supported by: NOW · Modellregionen Elektromobilität · Wasserstoff-Gesellschaft Hamburg e.V.

Part Three - Thursday, 29th of September 2016 (Language: English; Chinese supported)

Module 5: Excursion day from Hamburg to Wolfsburg

09:30	(5.2)	**Visit of E-Bus charging facilities at the Central Bus Station (ZOB)** ▸ Guided by HOCHBAHN Hamburg (Bus Line 109)
10:00	(5.3)	**Long-distance Bus trip to VW Headquarters Wolfsburg** ▸ Departure at Central station north entrance (Kirchenallee) Address: Kirchenallee, 20097 Hamburg
13:00	(5.4)	**Visit e-Golf production line at VW-Headquarters in Wolfsburg** ▸ 13:00 lunch at VW canteen ▸ 13:30 Presentation about VW's business and future strategy ▸ 14:30-16:00 Visit e-Golf production line
16:15	(5.5)	**Long-distance Bus trip back to Hamburg** ▸ Arrival in Hamburg around 7 pm

Excursion fee: SINGER-partners and guests from China are free, 30 persons max. External guests pay 50 EUR each (travel expenses).

Open program (optional)

Friday, 30th of September:

- **Individual talks and contacts**

Venue: HafenCity University Hamburg

Map section

Address

HafenCity Universität Hamburg
Überseeallee 16
20457 Hamburg

Approach

Long-distance train: Hamburg Hauptbahnhof, 25 min. walk
ÖPNV: U4, Station „HafenCity Universität" or BUS Line 111, Bus-stop „Shanghaiallee"
Parking: Parkhaus, Überseeallee 3

CONFERENCE EXCURSIONS

Stromnetz Infotainer - HafenCity Hamburg

Photo: Johannes Lauer

E-Bus Charging Station ZOB Hamburg

Pkoto: Johannes Lauer

HafenCity Sightseeing Tour

Photo: Johannes Lauer

Hydrogen Station - HafenCity Hamburg

Volkswagen E-Golf Production Line - Wolfsburg

CONFERENCE IMPRESSIONS

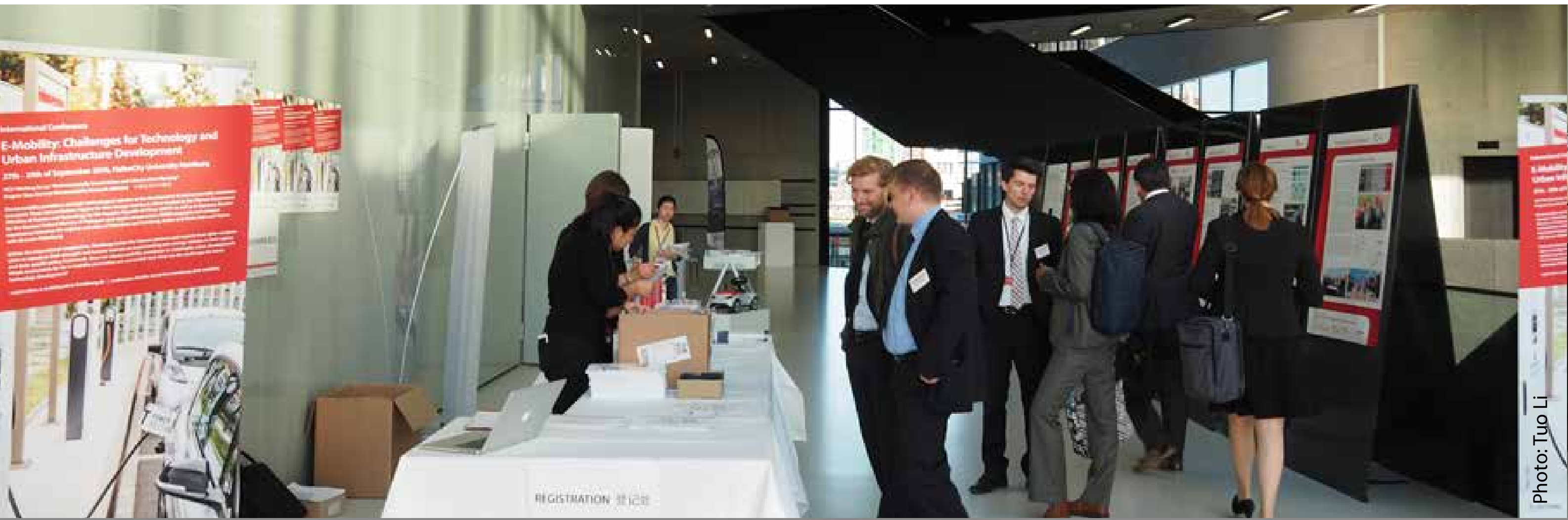


Photo: Tuo Li

Photo: Tuo Li

Photo: Tuo Li

Built-in wireless cell sensors, optical cell sensors and decentralized signal processing for precise cell state estimation

Author
Name: Karl-Ragmar Riemschneider
Title: Prof. Dr.-Ing.
Institution: Hochschule für Angewandte Wissenschaften Hamburg (HAW)
Country: Germany
Co-Authors: Dipl.-Phys. Valentin Roscher, M.Sc. Nico Sassano, HAW Hamburg

Summary:

Lithium ion batteries require permanent monitoring during operation to ensure safety and efficiency of use. This is especially valid for batteries for the automotive sector, including electromobility and starter batteries. In our research group at the HAW Hamburg, a wireless sensor system was developed to provide continuous monitoring of individual cell voltage and temperature. Data is reported to a central control unit. In this setup, no additional measurement wires between cells are necessary, eliminating the cost and weight of several hundred measurement cables as well as reducing problems arising from faulty connectors. Battery current can be measured centrally per module if all cells are connected in series.

As an additional functionality, the sensor system is able to perform Electrochemical Impedance Spectroscopy (EIS) by combining high-precision low-jitter voltage and current measurements. Spectral data is preprocessed on the sensor to lower load on the wireless channel. To present a complete system, a compact excitation source for AC and DC current has been developed recently to allow on-board EIS measurements during operation and rest phases e.g. in car batteries.

We expect that integration of measurement and distributed computing into a single sensor chip will provide a low-cost low-effort alternative to current wired cell sensor approaches. Regular EIS measurements can increase safety, reliability and energy efficiency of the battery cells by improving cell state determination and prediction.

Modeling Li-ion batteries for state-of-charge, state-of-health and temperature indication

Author
Name: Dmitri L. Danilov
Title: Dr.
Institution: Forschungszentrum Jülich / Eindhoven University of Technology
Country: Germany / The Netherlands

Co-Author: Prof. Dr. Peter H.L. Notten, Forschungszentrum Jülich / Eindhoven University of Technology, Germany / the Netherlands, p.notten@fz-juelich.de

Summary:

Intensive development of various kinds of Electrical Vehicles (EV) raises the demand for advanced on-board Battery Management Systems (BMS). Advanced BMS must ensure safe and reliable operation of the battery (pack) and provide a driver for a number of important indications, such as State-of-Charge, remaining operation time and State-of-Health. A mathematical model of rechargeable battery is the core of the BMS. Such models are based on a detailed description of physical and (electro-)chemical processes, and therefore contain a large number of non-linear algebraic, ordinary and partial differential equations. The high complexity and large amount of computing power necessary for a proper implementation of such models creates, however, a barrier for their introduction to automotive applications. Nevertheless, many simple and efficient approaches to battery modeling exist, including aging determination, adaptive State-of-Charge indication and sensor less temperature estimation. Advantageously, these methods are not computationally demanding and therefore very well suitable for implementation in modern BMS.

General requirements and challenges for battery management in EV

Author
Name: Ghanim Putrus
Title: Professor of Electrical Power Engineering, BSc, MSc, PhD, CEng, MIET
Institution: Faculty of Engineering and Environment, Northumbria University, Newcastle upon Tyne NE1 8ST, UK
Country: United Kingdom

Summary:

The need for high-energy batteries to power laptops, mobile phones and electric vehicles is driving the current interest and developments in battery technologies. Lithium ion batteries are the current industry standard for these applications, due to their relatively high energy density and low self-discharge properties. However, as other type of batteries, they do lose capacity with time and cycling.

Battery performance and lifetime depend not only on its chemistry but also on the way the cells (comprising the battery pack) are managed and the battery is used. A battery management system is usually used to monitor the state of health of individual cells and ensure that cells loading and voltages are balanced. External factors such as charging/discharging profiles also affect the battery lifetime, and this makes battery management more challenging.

This talk will give an overview of the main factors that affect battery degradation and try to define general requirements and challenges to retain the state of health of the battery. Results of experimental tests conducted on Li ion cells in order to define favorable charging/discharging profiles will be presented. Smart control of battery charging/discharging and its role in reducing battery degradation and extending its lifetime will be introduced.

Customised Lithium Cell Solutions

Author
Name: Torge Thönnessen
Institution: Custom Cells Itzehoe GmbH
Country: Germany

Summary:

Batteries are used in a wide variety of applications. Customized battery solutions are often required, e.g. in high-temperature environments or construction space limitations. Material features such as improved heat and shock resistance can be appropriately produced. Also the cell form factor can be tailored.

Custom Cells Itzehoe GmbH (CCI) provides customized lithium ion cells and cell components for demanding and research applications. A modular system allows the design of solutions for various requirement profiles. The manufacturing concept is based on lamination technology and enables CCI to produce customized lithium accumulators offering a broad range of formats and a whole spectrum of unique features. Small standardized test cells are the basis for rapidly generating a range of parameters that can be reliably scaled into application-specific, large-format lithium accumulators.

CCI also provides cell components for research institutes. This includes various cathode and anode electrodes cut for lab scale coin cells or as electrode coils for small-scale manufacturing. Electrode chemistry as well as physical parameters such as layer thickness and current collector properties can be chosen from a broad range of options.

In the talk, CCI will outline processes and materials used in cell and cell component production and present real-world applications of customized battery cells.

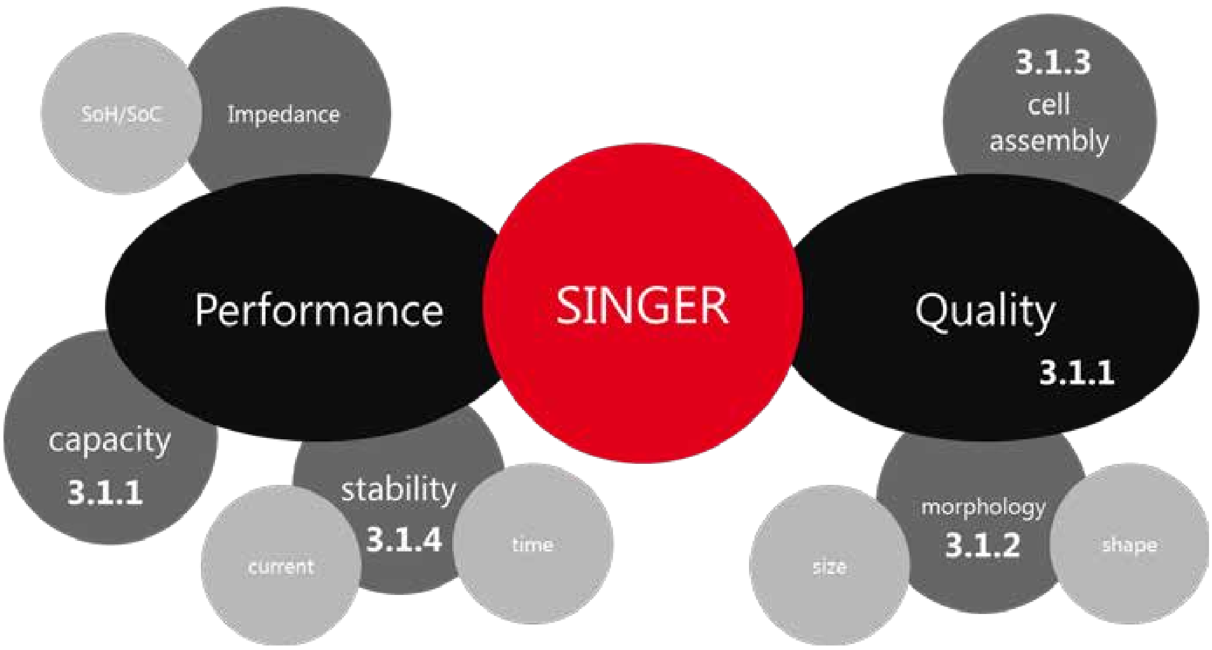
Different generations of Lithium based batteries in the field of EV

Author
Name: Michael Fröba
Title: Prof. Dr. rer. nat.
Institution: University Hamburg
Country: Germany

Co-Authors:
Anika Juhl, Sebastian Kraas and Julia Ziegler, University Hamburg, Germany

Summary:
The materials used as anodes and cathodes in lithium ion batteries nowadays are classified as first generation. Typical materials are graphite (anode), $LiCoO_2$ and $LiMn_2O_4$ (both cathode mate-rials). These materials are well-known and the battery chemistry (electrolyte and separator) is highly developed. For electric vehicles, a higher energy density is necessary. To achieve this new materials are used in batteries. Main focus for second generation batteries is the lithium sulphur battery. The energy density in Li-S batteries is up to five times higher and sulphur is extremely cheap. The third generation of lithium batteries will use oxygen as active material. This means the weight of the anode can be drastically reduced.

This presentation will start with a general overview about the chemistry of the widely used active materials in modern EVs and the second part will cover the new generation of lithium batteries.



Source: Fröba (2016)

The progress report on the research of power battery materials at PKUSZ

Author
Name: LIU Yidong
Title: Researcher
Institution: Peking University Shenzhen Graduate School
Country: P.R. China

Summary:
School of Advanced Materials (SAM), Peking University Shenzhen Graduate School (PKUSZ) played as the technical representative of the Shenzhen-Hamburg new energy vehicle demonstration and promotion partnership under SINGER project. The international workshop was held in PKUSZ with the attendance of Profs. Michael Fröba, Karl-Ragmar Riemschneider and Johannes Lauer of HCU. The co-operations on scholar exchanges and research are still going. SAM got insignificant contributions on Li-ion transfer mechanism, which resulted several important publications. Prof. Pan was awarded high-cited scholars of Elsevier in 2015 as well. After the national center for international research on EV power battery and materials, SAM successfully gained National Key R&D Program of 2016, Key Technology of Materials Genome on All Solid State Lithium Battery and Materials. So far SAM has built up a comprehensive facility for battery research valued RMB 80 M. And we encourage partner students to apply degree or post-doc program in the sunshine Shenzhen. Best wishes, SINGER.

Different generations of Lithium based batteries in the field of EV

Author
Name: Sebastian Kraas
Title: Dr.
Institution: University Hamburg
Country: Germany

Co-Authors:
Julia Ziegler and Michael Fröba, University Hamburg, Germany

Summary:
One of the most often cited drawbacks of battery electric cars is the inability to recharge the batteries fast. The reasons behind this are manifold and cannot be pinned down to one single component. Some reasons are more in the technical field, like lack of electricity during recharge (super chargers), others are at the junction of engineering and chemistry (heat of reaction and re-movement thereof) and of course, since batteries are electrochemical energy storages some reasons lie within the chemistry of the materials used as anode or cathode. Having this in mind, we will look onto this topic from a materials chemist perspective: Which materials can be used for fast-charging? How are these materials structured? What can be done to improve the materials?

LITERATURE AND SOURCES

BBSR, Bundesinstitut für Bau-, Stadt- und Raumforschung (2012): Raumordnungsbericht 2011, Bonn.

BMVI, Bundesministerium für Verkehr und digitale Infrastruktur (2016): Modellregion Hamburg. Online abrufbar unter: http://www.bmvi.de/SharedDocs/DE/Artikel/G/modellregion-hamburg.html?nn=12830.

Brink, M. (2016): Hamburger Hochschulen veranstalten internationale Konferenz zum Zukunftsthema Elektromobilität. HafenCity Universität Hamburg, Hamburg. Online: https://www.hcu-hamburg.de/fileadmin/documents/Presse/2016/16-09-27_HCU_PM_Elektromobilitaet_Konferenz.pdf.

De Jong, M. W. (2016): Explaining success and failure in Sino-European collaboration. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development“, 27.-28.09.2016, HCU Hamburg.

Fröba, M. (2016): Material quality standards for lithium ion batteries, University Hamburg. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development“, 27.-28.09.2016, HCU Hamburg.

Fröba, M; Steinkamp, C. (2014): Deutsch-chinesische Kooperation: Team der Universität Hamburg erhält 403.000 Euro für Forschung zur Elektromobilität. Online abrufbar unter: https://www.uni-hamburg.de/newsroom/presse/2014/pm21.html.

Garche, S. (2016): Overview Model Region E-Mobility Rhine-Ruhr, Energy Engineers. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development“, 27.-28.09.2016, HCU Hamburg.

Guo, Y. (2016): Wuhan EV Promotion and Application. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development“, 27.-28.09.2016, HCU Hamburg.

hySOLUTIONS (2013): Vorhabensbeschreibung, Projekt SINGER Sino-German Electromobility Research, Chinesisch-Deutsche Kooperation in der Elektromobilität, Hamburg.

Kulus, D.; Prill, T. (2016): e-Quartier Hamburg: Smart e-mobility solutions for residential areas in Hamburg. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development“, 27.-28.09.2016, HCU Hamburg.

Lauer, J. (2016): E-Mobility and Urban Development in Hamburg and Shenzhen. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development", 27.-28.09.2016, HCU Hamburg.

Lauer, J.; Dickhaut, W. (2016): Shenzhen's New Energy Vehicles and charging infrastructure – policies, instruments and development. In: ZEBAU (Hrsg.), SBE16 Conference Hamburg, Druckerei in St. Pauli, Hamburg, S. 1040-1049.

Linnenkamp, M. (2016): Metropolitan Region Amsterdam - Electric (MRA-E). Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development", 27.-28.09.2016, HCU Hamburg.

Li, Z. (2016): Influence of EVs and Smart Transport, Tsinghua University, Graduate School at Shenzhen. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development", 27.-28.09.2016, HCU Hamburg.

Lu, X. (2016): The progress report of the demonstration and promotion of new energy vehicles in Hamburg & Shenzhen, The Development and Reform Commission of Shenzhen Municipality. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development", 27.-28.09.2016, HCU Hamburg.

Ma, C. (2016): The Promotion of New Energy Vehicle in Dalian, Municipality of Dalian. Presented by Yafu Zhou at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development", 27.-28.09.2016, HCU Hamburg.

Minnich, L. (2016): Changing drivetrain and behaviour. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development", 27.-28.09.2016, HCU Hamburg.

NOW, Nationale Organisation Wasserstoff- und Brennstoffzellentechnologie (2009): Jahresbericht 2009 Berlin.

Pomränke, N. (2016): Building Complex above Qianhai Bay's Integrated Transport Hub of Shenzhen Metro, Architekten von Gerkan, Marg und Partner. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development", 27.-28.09.2016, HCU Hamburg.

Richter, A. (2016): Overview of policies to promote e-mobility in Hamburg, Ministry of Economics, Transport and Innovation, Free and Hanseatic City of Hamburg. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development", 27.-28.09.2016, HCU Hamburg.

Scheler, C. (2016): Finding the right location..., ARGUS Stadt- und Verkehrsplanung. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development", 27.-28.09.2016, HCU Hamburg.

Van den Berg, L.; Jacobs, W.; Nijdam, M.; Tuijl, E. (2015): Cities and Partnerships for Sustainable Urban Development. Kresl, K.-P. (Hrsg.), Edward Elgar, Cheltenham (UK)/Northampton (USA).

Zhang, K. (2016): Optimal Allocation of Electric-Bus Charging Stations Considering Electrical Distribution and Traffic Network, Tsinghua University, Graduate School at Shenzhen. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development", 27.-28.09.2016, HCU Hamburg.

Zisler, S. (2016): Creating the foundation of urban emobility: Expansion of the charging infrastructure in Hamburg, Stromnetz Hamburg GmbH. Presented at the international Conference „E-Mobility: Challenges for Technology and Urban Infrastructure Development", 27.-28.09.2016, HCU Hamburg.