

BMVI “HyLand – Hydrogen Regions in Germany” Initiative



Mobility and logistics with hydrogen from renewable energies – within the framework of the National Innovation Program Hydrogen and Fuel Cell Technology (NIP II), HyLand supports the transition in transport in 25 municipalities and regions. Coordination with other German and European H₂ regions is intended to establish a valuable network of activities.

HyPerformer

- Three regions with existing hydrogen projects
- Selected through a nationwide competition in 2019
- From 2020 onwards, implementation of the competition concepts to expand hydrogen activities
- Funding support of 20 million euros each
- Total project volume 195 million euros

HyExperts

- 13 regions with initial project experience and knowledge
- Selected through a nationwide competition in 2019
- From 2020 onwards, refinement of competition concepts
- Funding support of 20 million euros each

HyStarter

- Nine regions
- Chosen in 2019 through a nationwide selection process
- Will receive 12 months of organisational and content-related support in the development of concept ideas for green hydrogen

NOW – Annual Report **2019**

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FOREWORD BY FEDERAL MINISTER ANDREAS SCHEUER MdB



Modern mobility is clean and efficient

Good mobility must be a given. It contributes to the quality of life in our country while facilitating greater flexibility, prosperity and better living conditions. Whether by car, bus, train or bicycle: people legitimately have high expectations of having access to a functioning mobility system in the city and in the countryside. Our task is therefore to continually adapt, develop and modernise this system across the board.

Modern mobility involves emission-free fuels and efficient drive systems. The integration of renewable energy in the transport sector is already visible today – the number of electric passenger cars increased by 76 per cent (battery) and 44 per cent (plug-in hybrids) in 2019. And also for hydrogen and fuel cell technology, the trend in new purchases and registrations is clearly on the up.

BMVI invests in infrastructure for alternative fuels

The expansion of battery and fuel cell infrastructure is an essential prerequisite for the further ramp-up of these technologies. At the end of 2019, Germany boasted 82 hydrogen filling stations and around 24,000 electric charging points (normal and fast), representing around 33 and 50 per cent more alternative infrastructure than in the previous year, respectively. The BMVI support programmes play a central role in this regard. It is also clear that we now need to have a correspondingly greater choice of such vehicles – preferably from our German manufacturers.

In the area of charging infrastructure, almost 15,000 normal and 4,000 fast charging points are currently under construction or have already been installed across Germany thanks to investments by the BMVI. At the turn of the year 2019/2020, we took the next step for electric charging: the BMVI commissioned NOW to establish the new German Centre for Charging Infrastructure (Nationale Leitstelle Ladeinfrastruktur). The core tasks of the national centre are the assessment of demand, the coordinated development of a nationwide fast charging network and the coordination of federal and state activities. The centre will also support municipalities in planning and implementing charging infrastructure development. The first goal is to establish 1,000 fast-charging locations – so-called hubs – at which a large number of charging points will be provided and which can be expanded in a modular manner, and therefore swiftly.

The establishment of modern mobility begins in the regions

Modern mobility evolves in close proximity to the people. For this reason, it is essential to ensure we have the federal states and especially the local municipalities involved and at our side. We are successfully doing this. One example is the resounding success of the hydrogen regions. “Every region can become a hydrogen region” was the motto of our appeal. With the HyLand concept, municipalities are provided with tailored services for the launch or further development of hydrogen technology on location: Nine HyStarters will be supported for two years in building a network of stakeholders and developing an initial concept. 13 HyExperts will each receive 300,000 euros to detail projects or conduct a study – enabling them to get started in practical terms. And finally, three HyPerformers will each receive 20 million euros to acquire the necessary technology and start deploying hydrogen and fuel cell products on a large scale. The regional applicants’ own investment commitments amount to as much as 270 million euros. A total of almost 200 regions or municipalities from all over Germany have applied across the three categories. This shows that the interest is clearly there. We therefore have a responsibility to continue to provide the regions with good offers.

Hydrogen is needed to increasingly move away from fossil fuels in all areas of energy consumption – including transport.

Sincerely yours,

Andreas Scheuer MdB

Federal Minister of Transport and
Digital Infrastructure

FOREWORD BY WOLFGANG AXTHAMMER



With the UN Climate Change Conference in 2019, the topic of climate protection reached a further peak. Measures to reduce and contain the rise in CO₂ have never been more pressing.

In the interests of achieving sustainable growth and a healthy environment, industry and the public are focusing on the use and application of innovative, alternative and climate-neutral technologies.

NOW GmbH is making a major contribution towards achieving Germany's climate targets by coordinating the federal government's technology programmes. It supports and implements the development and use of alternative energy supply and alternative drive systems in the transport sector within the framework of programmes relating to battery electric mobility, the mobility and fuels strategy, charging infrastructure for electric mobility and the National Innovation Programme Hydrogen and Fuel Cell Technology.

RENDERING MOBILITY AND LOGISTICS CLIMATE-NEUTRAL CONSTITUTES AN OVERARCHING BUSINESS, SOCIAL AND POLITICAL CHALLENGE FOR THIS DECADE. NOW GMBH COORDINATES THE FEDERAL GOVERNMENT'S KEY TECHNOLOGY PROGRAMMES TO ACHIEVE THIS.

At this point, I would like to express my sincere thanks to the four federal ministries (BMVI, BMWi, BMU and BMBF) that are actively involved in shaping the strategic direction of NOW GmbH, and which, by delegating further programmes to NOW GmbH, express the trust they continue to place in NOW GmbH.

I would also like to extend my special thanks to the employees of NOW GmbH for their impassioned commitment to the successful implementation of these programmes and to driving them forward.

In 2019, NOW GmbH employees coordinated projects with a funding volume of more than 640 million euros. Their efforts, and thus the importance of NOW GmbH's federal programme coordination activities, were underscored by the momentum developed at the end of the year as well as by many successes: the stakeholder conference of three federal ministries on the development of a national hydrogen strategy; the specialist conference on electric mobility as a forum for the exchange of ideas for local stakeholders; the measures for the transport sector identified in the Climate Protection Programme 2030; the master plan for the development of a comprehensive, nationwide charging infrastructure; and the commissioning of NOW GmbH with the implementation of the German Centre for Charging Infrastructure.

Please enjoy reading our Annual Report of 2019! I trust that you will find it a source of inspiration and motivation to press ahead with your climate protection efforts with even greater intensity and determination, as we enter the 2020s.

Best regards,

Wolfgang Axthammer

Managing Director, NOW GmbH



NOW GmbH currently coordinates and manages the German government's National Innovation Programme Hydrogen and Fuel Cell Technology (NIP) and the Electric Mobility and Charging Infrastructure funding guidelines of the Federal Ministry of Transport and Digital Infrastructure (BMVI – Bundesministerium für Verkehr und digitale Infrastruktur). On behalf of the BMVI, NOW GmbH also supports the further development of the Mobility and Fuels Strategy (MFS) as well as the implementation of EU Directive 2014/94/EU concerning the development of alternative fuels infrastructure (Clean Power for Transport, CPT). Specifically, NOW GmbH is involved in the development of an overall strategy taking into account the individual fuel options, analyses the positions of relevant stakeholders and coordinates projects with German participation, such as those within the scope of the Trans-European Transport Networks (TEN-T). On behalf of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU – Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit), NOW GmbH supports the Environmental Technologies Export Initiative in the field of hydrogen and fuel cell technology and the German-Japanese cooperation in the field of power-to-gas technology.



Federal Ministry
of Transport and
Digital Infrastructure



Federal Ministry
for Economic Affairs
and Energy



Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety



Federal Ministry
of Education
and Research

NATIONAL INNOVATION PROGRAMME HYDROGEN AND FUEL CELL TECHNOLOGY (NIP)

The German government has been supporting efforts to prepare the market for hydrogen and fuel cell technology with the NIP since 2006. As part of the government's Hydrogen and Fuel Cell Technology 2016 to 2026 programme, the inter-ministerial NIP ensures continuity in research and development and addresses the issue of bringing the first products to series production to facilitate an activation of the market.

The NIP is implemented by means of appropriate measures of the federal ministries involved. The Federal Ministry of Transport and Digital Infrastructure (BMVI – Bundesministerium für Verkehr und digitale Infrastruktur) is initially allocating 480 million euros to support hydrogen and fuel cell technology for the period 2016 to 2022. Through the funding guidelines 'Measures for Research, Development and Innovation' and 'Measures for Market Activation within the framework of the National Innovation Programme Hydrogen and Fuel Cell Technology Phase 2 (Focus on Sustainable Mobility)', the BMVI supports the development of products that are technically ready for the market but are not yet competitive in the market ramp-up phase.

The Federal Ministry for Economic Affairs and Energy (BMWi – Bundesministerium für Wirtschaft und Energie) is continuing its funding of hydrogen and fuel cell technology in the field of applied research and development within the scope of the federal government's 7th Energy Research Programme with annual funding of around 25 million euros. In addition, the BMWi launched a funding programme for the acquisition of fuel cell heating devices for private customers in 2016 as part of the National Action Plan for Energy Efficiency (NAPE – Nationaler Aktionsplan Energieeffizienz).

As in the first NIP phase, the Federal Ministries for the Environment (BMU – Bundesministerium für Umwelt) and for Education and Research (BMBF – Bundesministerium für Bildung und Forschung) continue to be actively involved in shaping the strategic framework of the NIP through the structures of NOW GmbH.

BMVI funding support 2018 – 2019

AREAS	FUNDING/€
R&D	160,094,043
MARKET ACTIVATION	137,061,464
CLUSTER	516,741
STUDIES	5,365,875
TOTAL	303,038,123

BMWfunding support 2018 – 2019

AREAS	FUNDING/€
TRANSPORT	24,025,055
INTERDISCIPLINARY	19,083,790
INDUSTRY	12,844,734
HOUSEHOLD ENERGY	2,835,786
SPECIAL MARKETS	1,537,597
HYDROGEN PRODUCTION	1,333,231
TOTAL	61,660,193



Federal Ministry
of Transport and
Digital Infrastructure

CHARGING INFRASTRUCTURE FOR ELECTRIC VEHICLES FUNDING GUIDELINE

One of the essential criteria for achieving the energy and climate protection policy goals of the German government is the switch of the energy source predominantly used in transport to that of electricity from renewable sources in conjunction with innovative drive technologies. Electric mobility is a fundamental prerequisite for accomplishing this and a decisive factor for realising the energy transition targets. With the charging infrastructure funding guideline (Förderrichtlinie Ladeinfrastruktur), the federal government seeks to initiate the establishment of a comprehensive and user-friendly network of charging infrastructure so that electric vehicle users can recharge quickly and easily anywhere in Germany. The main purpose of the funding guideline is therefore to establish a fast charging infrastructure. In addition, the further expansion of the normal charging infrastructure is to be supported in order to meet customer needs according to driving and parking behaviour (e.g. overnight charging of e-vehicles by residents of apartment buildings without a garage in the city, car sharing, recharging during visits to department stores, restaurants, cinemas, etc.). The aim is to install at least 15,000 charging stations by 2020, for which the German government is allocating 300 million euros from 2017 to 2020. Private investors as well as cities and municipalities are supported.

The BMVI's federal charging infrastructure programme is generating great demand. More than 5,000 applications for funding were received in the first four calls for proposals. To date, applications for a total of 22,000 charging points have been approved, of which 15,500 are normal charging points and 4,500 are fast charging points. This corresponds to a funding volume of more than 137 million euros. The number of existing charging points has therefore more than doubled. A further call will be published in 2020.

**Approved normal (NCP) and fast charging points (FCP) in
the Federal Charging Infrastructure Funding Programme
(Status: 20.01.2020)**

	Approved		In operation
	NLP	NCP	NCP & FCP combined
Baden-Württemberg	3,257	800	1,594
Bavaria	2,420	927	1,246
Berlin	79	45	36
Brandenburg	259	135	190
Bremen	83	54	84
Hamburg	550	80	515
Hesse	662	248	390
Lower Saxony	1,532	291	957
Mecklenburg-Western Pomerania	129	38	31
North Rhine-Westphalia	2,560	474	1,183
Rhineland-Palatinate	879	276	574
Saarland	171	39	91
Saxony	592	139	329
Saxony-Anhalt	191	88	86
Schleswig-Holstein	768	83	387
Thuringia	334	117	265
Total	14,466	3,834	7,958



LOCAL ELECTRIC MOBILITY (ELEKTROMOBILITÄT VOR ORT)

With the “Elektromobilität vor Ort” funding programme (Electric Mobility Funding Guideline) for local electric mobility, the Federal Ministry of Transport and Digital Infrastructure (BMVI – Bundesministerium für Verkehr und digitale Infrastruktur) supports cooperation between industry, science and the public sector in order to promote the further market ramp-up of electric mobility and to firmly entrench it in everyday life. The funding programme coordinated by NOW GmbH on behalf of the BMVI is especially targeted at municipalities and municipally integrated fleets.

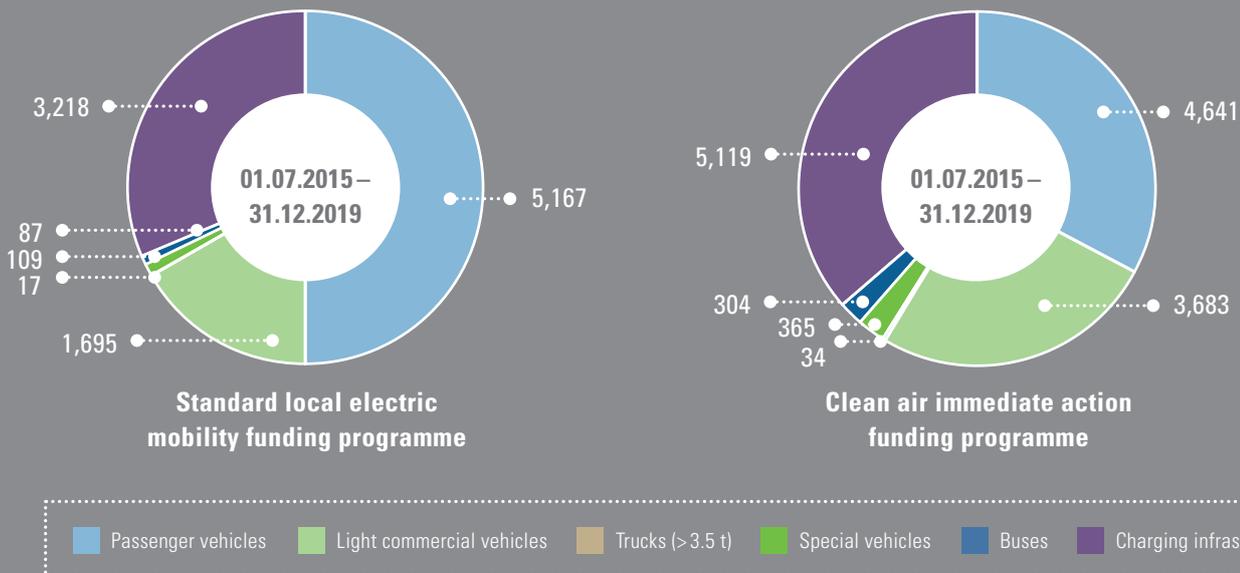
Three key funding priorities were initiated in 2015 as part of the Electric Mobility Funding Guideline, for implementation: investment funding for establishing vehicle fleets and operational charging infrastructure; funding for preliminary conceptual consideration (studies and municipal electric mobility concepts); and funding for research and development in joint projects. As a result, a broad range of funding opportunities was created at an early stage to provide optimal support for the market ramp-up. Demand for the three instruments remained at a consistently high level over the term of the funding programme, or in some cases recorded a strong increase. Funding support for procurement is implemented through two programmes which are supported by the BMVI: the ‘Clean Air’ immediate action programme and the ‘Standard Local Electric Mobility’ funding programme. The immediate action programme is particularly aimed at municipalities where the threshold values for nitrogen dioxide are exceeded. The standard support programme, on the other hand, is open to all municipalities in Germany. The concept funding complements the area of investment funding. It enables the preliminary consideration of central, electric mobility issues and, for example, lays the foundations for the sustainable development of fleets or charging infrastructures in municipalities. Both funding priorities are supplemented by research and development activities on central issues of electric mobility that are not tied to specific technologies or modes of transport.

Together with the BMVI’s overarching accompanying research programme, which is coordinated by NOW GmbH, insights can thereby be gained and developed at the funding programme level. In addition, the programme can react to market requirements in a targeted manner (e.g. in the form of annual calls for funding).

Budget overview (cumulative): Electric Mobility Funding Guideline (01.07.2015-31.12.2019)



Procurement of vehicles and charging infrastructure (market activation)



Discrepancies in the figures compared with the previous year are due, among other things, to the fact that light commercial vehicles (N1, up to 3.5 t) are now included in a separate category and are no longer included under passenger cars as in the previous year.

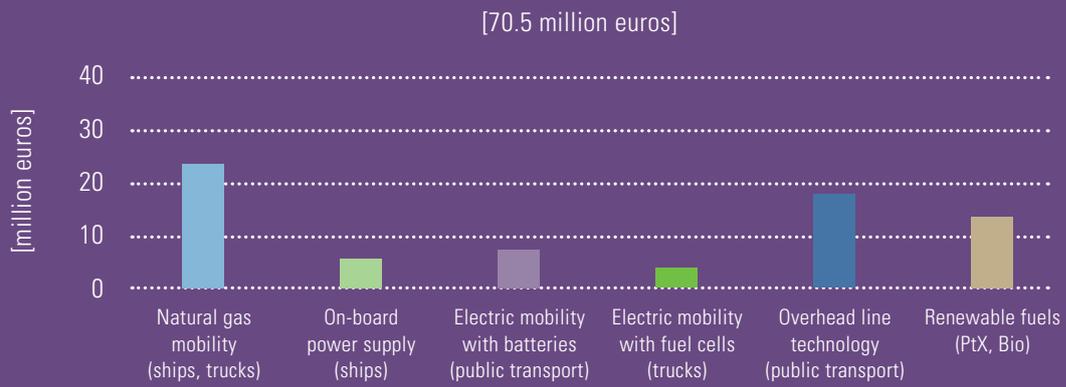


MOBILITY AND FUELS STRATEGY OF THE FEDERAL GOVERNMENT

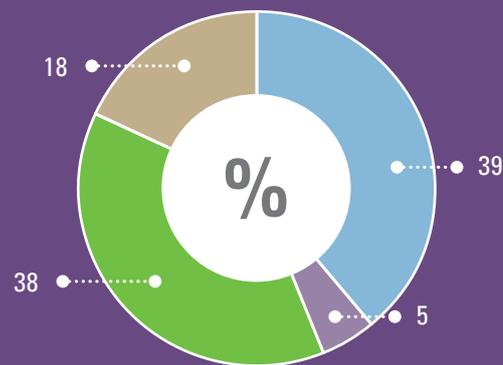
As a key platform for shaping the energy transition in the area of transport, the German government's Mobility and Fuels Strategy (MFS; in German: Mobilitäts- und Kraftstoffstrategie (MKS)) continued to be further developed in 2019. Notably, it was expanded to include the measures in the 'alternative fuels', 'freight transport' and 'commercial vehicles' fields of action as specified in the Climate Protection Programme 2030. For these new measures, the MFS team at NOW GmbH also supports the BMVI in the development and implementation of market incentive programmes. NOW GmbH has developed a funding concept for the environmentally friendly supply of on-board and mobile shore-side electricity. The associated funding guidelines are to be published in 2020. With a second call for funding in the area of LNG equipping and retrofitting of seagoing vessels, a market-driven funding framework has been established. Various investment and model projects are being implemented across technologies and market sectors to further develop the MFS. For the projects being implemented in the year 2019, funding amounting to around 70.5 million euros was approved, with total expenditure (including the beneficiaries' own contributions) amounting to around 132.3 million euros.

The spectrum of technology covered by the MFS is clearly evident from the model and investment projects supported. In addition to the support of forward-looking projects in the field of alternative drives and fuels for shipping, such projects are also being particularly implemented in public transport and road freight transport as well as in the field of renewable fuels (including aviation). One of the highlights of the support provided by NOW GmbH to the BMVI with regard to the implementation of the Alternative Fuels Infrastructure Directive (AFID) 2014/94/EU and related issues in the area of international cooperation in 2019, was the preparation of the first national AFID report for the EU Commission. This report contains a status quo on the development of alternative fuel infrastructures in Germany and an overview of the respective measures taken by the federal and state governments for further infrastructure development.

Approved funding volumes for model and investment projects to be implemented in 2019 (by technology area)



Share of approved funding volumes of model and investment projects in implementation in 2019 (by market segment)

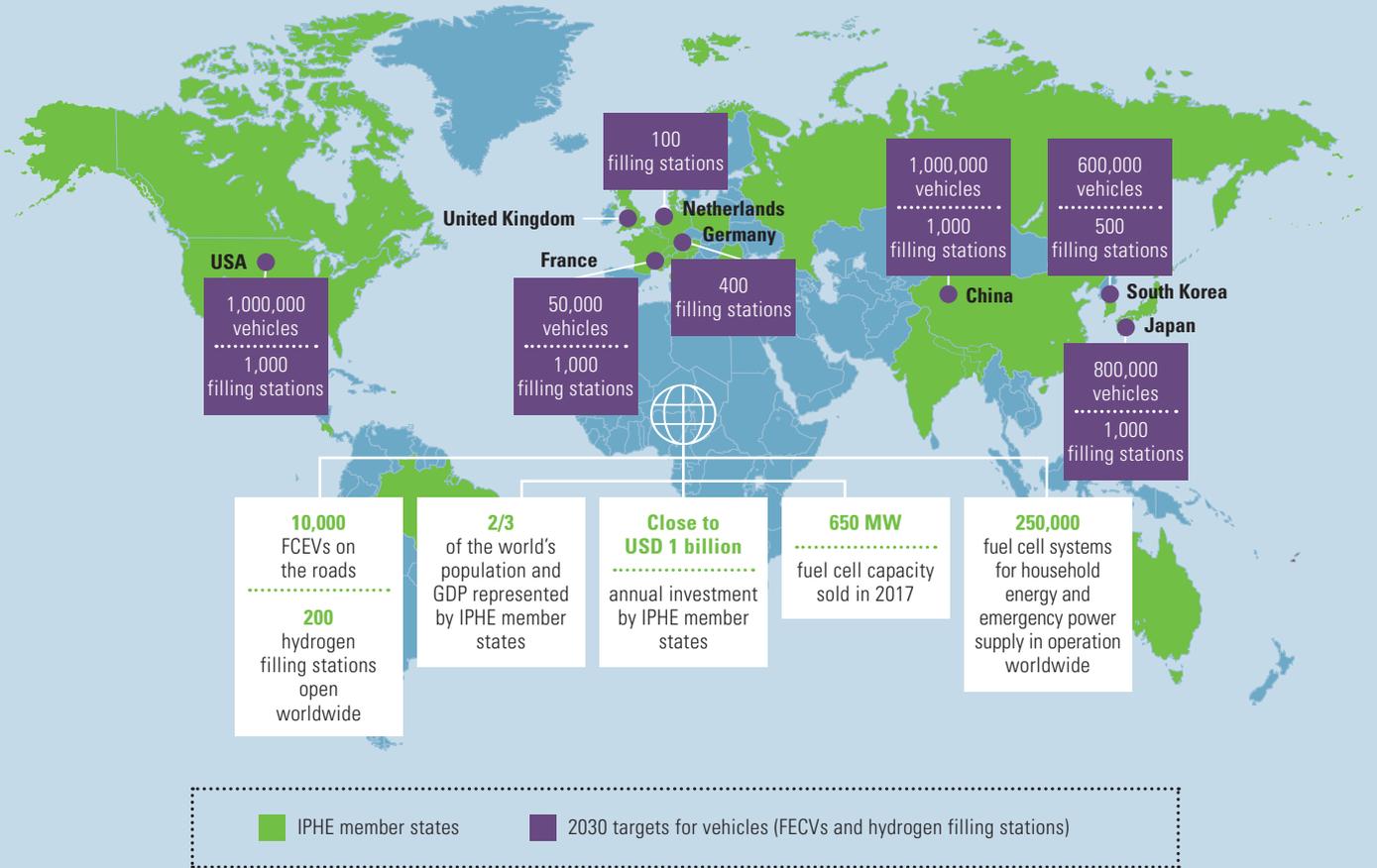


INTERNATIONAL COOPERATION

In an international context, the hydrogen technology and sustainable mobility sector continued to exhibit ongoing momentum in 2019. While significant market developments can already be observed in the field of battery electric mobility, hydrogen technology in 2019 was mainly driven by strategic political decisions. To this end, Australia, for example, presented strategies for integrating hydrogen technology. The German federal government also initiated the development of a National Hydrogen Strategy, which is to be presented in 2020. Alongside industrial policy aspects, the strategies aim to decarbonise conventional energy systems. In this respect, hydrogen as an energy carrier offers the potential for international trade in renewable energies. It is aimed to establish the entire hydrogen value chain in the national markets with regional and integrated projects. Against this background, the European Commission has presented the H2Valley project in northern Netherlands. Comparable concepts are being pursued in Germany with the three NIP HyPerformer regions. Following the clear political positioning in the direction of hydrogen technology, the task now is to enable the market ramp-up of the technology with the first major demonstration projects. NOW GmbH is actively involved in this process with its International Cooperation division, but simultaneously also remains strongly involved internationally in the field of battery electric mobility.

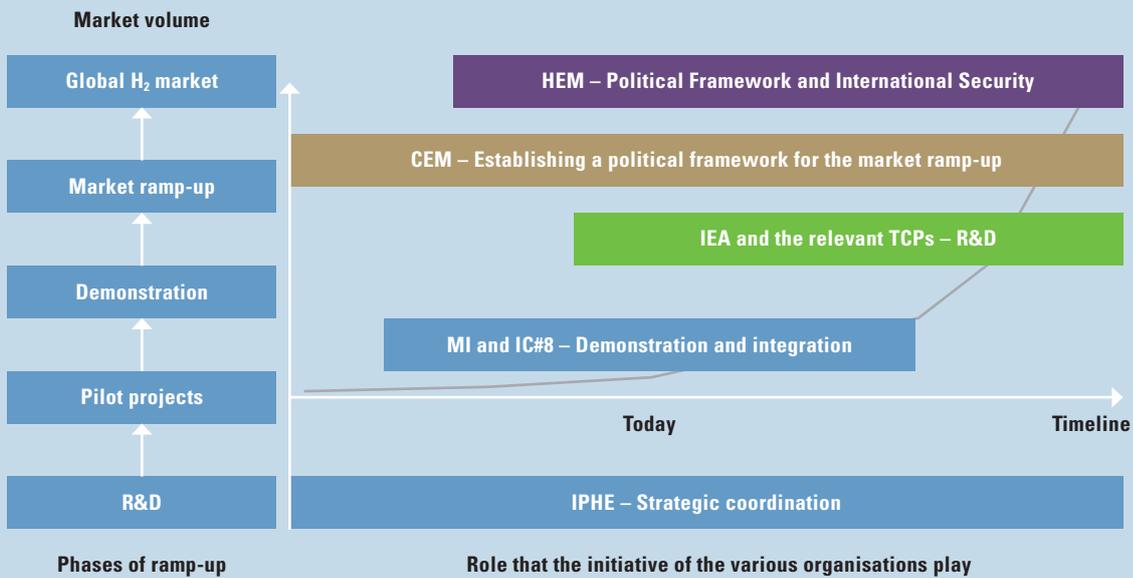
The developments in industrialised countries are necessary to enable economies of scale to be achieved and consequently enable the technology to enter the market. Nevertheless, efforts are also needed to transfer these concepts to other countries in order to push ahead with the early integration of innovative and sustainable technology in the establishment of new infrastructure, such as in emerging and developing countries. On behalf of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU – Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit), NOW GmbH is working on and supporting this process. Here, too, it is important to support the technical implementation of hydrogen and fuel cell technology as well as the establishment of the appropriate framework conditions. This process is initiated and coordinated by international networks in political, industrial and scientific contexts. To this end, NOW GmbH has entered into a cooperation with the German Society for International Cooperation (GIZ – Deutsche Gesellschaft für Internationale Zusammenarbeit).

MULTILATERAL COOPERATION



GLOBAL HYDROGEN INITIATIVES

Structure and boundaries of the initiatives



HEM = Hydrogen Energy Ministerial | IPHE = International Partnership for Hydrogen in the Economy
 CEM = Clean Energy Ministerial | MI = Mission Innovation | IC#8 = Innovation Challenge #8 | IEA = International Energy Agency

In order to ensure concerted action in an international context by the countries involved, the Federal Republic of Germany is participating in several global initiatives in the field of hydrogen technology.

The central initiative is the International Partnership for Hydrogen in the Economy IPHE ([↗ www.iphe.net](http://www.iphe.net)). This consortium of 19 countries and the European Commission has been coordinating and harmonising hydrogen technology for almost 17 years. Since 2018, the Hydrogen Energy Ministerial (HEM) has served to address the political decision-making level. The meeting of energy ministries from different nations was held for the second time in Tokyo in 2019.

Since May 2018, Innovation Challenge #8 of Mission Innovation ([↗ www.mission-innovation.net](http://www.mission-innovation.net)) has been used for the implementation and bundling of public projects for initial demonstrations of the technology. Here, the focus is on exchanging information on planned and ongoing projects as well as project initiation. In addition, the Hydrogen Initiative of the Clean Energy Ministerial was presented in May 2019. This initiative addresses the necessary market mechanisms, in cooperation with industry and investors. Here, too, the annual Clean Energy Ministerial meeting provides an opportunity to present findings at the highest political level.

The essential research aspects are addressed in two Technology Cooperation Programmes of the International Energy Agency (IEA): the IEA TCP Hydrogen ([↗ www.ieahia.org](http://www.ieahia.org)) and the IEA TCP Advanced Fuel Cells ([↗ www.ieafuelcell.com](http://www.ieafuelcell.com)), in which research topics are pursued by international scientists in the latter.

NOW GmbH is represented in all initiatives and thus actively participates within the international structure for the establishment of hydrogen technology in an international context.



EUROPE

The growing interest in hydrogen technology at the European level continued in 2019. As a result, market entry and market ramp-up are named as important aspects for achieving the EU's climate targets in the European Green Deal. Furthermore, hydrogen technology was declared a sector for which the Important Project of Common European Interest (IPCEI) can be initiated in 2019 at a European level. These projects serve to strengthen the value chain in the European internal market and address major cross-border projects. Here, projects in the field of semiconductor technology and battery cell production have already either been launched or announced.

The Programme Support Action (PSA) on the collection of data on alternative fuel infrastructure and the allocation of e-mobility IDs (IDACS) commenced in January 2019. The aim of the PSA is to increase consumer confidence in alternative drive systems and the corresponding fuel infrastructure, thereby helping them to become more widely used. The activities of the PSA take place within the framework of the Alternative Fuels Infrastructure Directive (AFID) 2014/94/EU. NOW GmbH provides support to the BMVI by continuously monitoring the alternative fuels infrastructure for the purpose of reporting to the European Commission.

Environmental Technologies Export Initiative of the BMU

The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU – Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit) promotes innovations in the field of environmental and climate protection in emerging and developing countries to accelerate sustainable economic development. With the BMU's Environmental Technologies Export Initiative, which was founded in 2016, environmental technologies, environmental awareness and knowledge are passed on in order to make a tangible contribution to the sustainable development of foreign countries. At the same time, it aims to identify new sales markets for the export of German environmental technologies. The export initiative's transfer of knowledge and technology extends across the BMU's various areas of expertise. One focus is on the area of environmentally friendly mobility. In cooperation with the German Society for International Cooperation (GIZ – Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH), NOW GmbH supports the BMU in establishing a network in developing and emerging countries to prepare, coordinate and implement activities for the use of climate-friendly hydrogen and fuel cell technologies. The aim is to use this network to pave the way for the application of hydrogen and fuel cell technologies. Through the strategic network with local industry partners, NOW GmbH will bring the status quo of hydrogen and fuel cell technology and current perspectives into the respective energy system considerations of the countries involved. Building on this, the aim is to identify potential cooperation partners in emerging and developing countries for concrete demonstration projects. This should lay the foundation for generating demand for German products in the field of environmental technologies and establishing the corresponding infrastructure.

ASIA

Japan

Japan also reached further milestones on the way to a hydrogen society in the last year. A revised roadmap came into force in March 2019 and in September, a technological development strategy on hydrogen and fuel cell applications became effective. The ministerial meeting on hydrogen took place for the second time in September 2019, following on from the Tokyo Statement on the need for global cooperation on hydrogen technology. The participants from more than 30 countries and organisations see the need to support the scaling up of hydrogen use by means of appropriate long-term national strategies and roadmaps. This should be achieved taking cooperation in the priority areas of the Tokyo Statement into account: standardisation, research and development, potential analysis and educational opportunities.

China

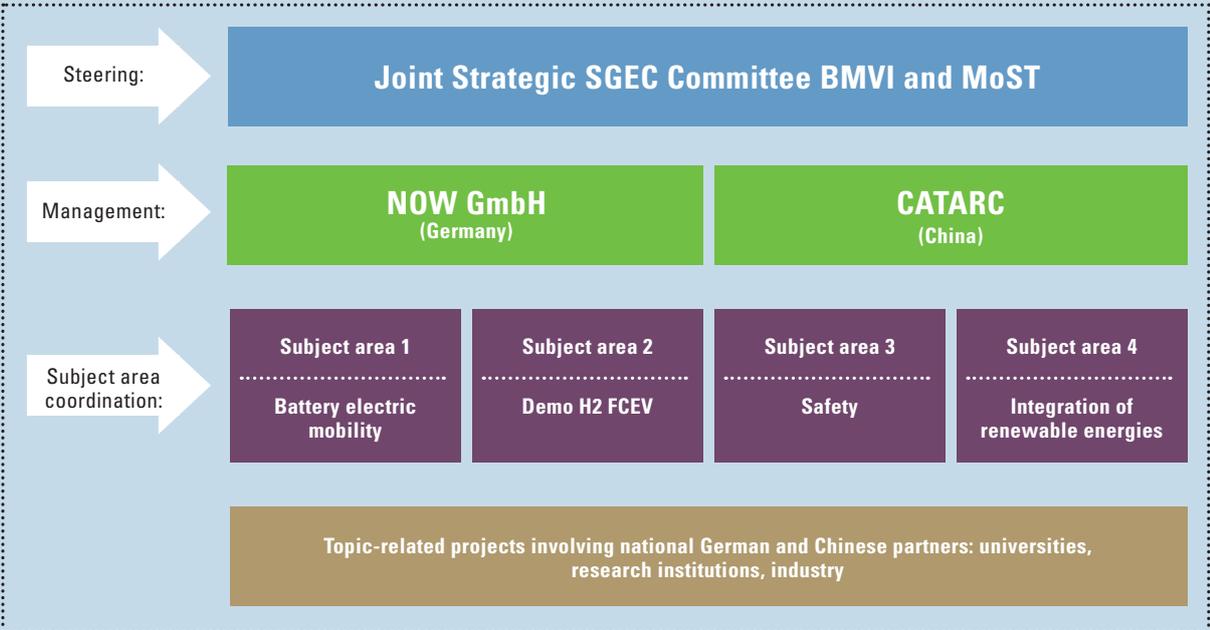
China's activity in the field of electric mobility with battery and hydrogen fuel cell technology is unbroken. Driven by climate and energy policy considerations and industrial policy goals, both technologies are being developed equally as key technologies of the future. From the overarching national considerations, it follows that in China, besides mobility, topics in the energy sector are also being addressed. Hydrogen is expected to play an important role here.

As the most important single market for German automobiles, the focus is on developments in electric mobility in China, and the long-standing cooperation in this area between the BMVI and the Chinese MoST has been further expanded. To this end, a letter of intent was signed in October to intensify and strengthen cooperation between the ministers. The specific cooperation activities will be continued in the Sino German Electro Mobility Innovation and Support Center (SGEC), where exchanges are already taking place in the form of communication and several cooperation projects, including research and development. The SGEC is implemented by the China Automotive Technology & Research Center (CATARC) and NOW GmbH. They are supported in their work by coordinators who act as observers, moderators and organisers and maintain close contact with Chinese partners in the individual topic areas.

POLICY FRAMEWORK FOR HYDROGEN TECHNOLOGIES IN CHINA



SGEC STRUCTURE AND FOUNDING OBJECTIVES



Electric mobility with batteries and hydrogen fuel cells in China

China is by far the largest such market in the world, accounting for approximately 50 per cent of global electric vehicle sales. Currently, the country is within the target corridor with regard to the state government's goal of having at least 5 million so-called New Energy Vehicles (NEV, incl. BEV, PHEV and FCEV) on the roads by the end of 2020. The issues associated with the provision of premiums for the purchase of electric vehicles – which, as things stand today, are to be phased out completely by the end of 2020 – were also discussed in 2019 against this backdrop.

Exchange on regulations, codes and standards for hydrogen electric mobility

China is striving to define uniform and safe design requirements for electric drives and the corresponding fuel infrastructure. Up to now, this has primarily involved the development of national standards and regulations that have direct legal validity within China. In a joint SGEC -project, NOW GmbH and CATARC are preparing cooperation on Regulations, Codes and Standards (RCS) for hydrogen electric mobility.

The development of a common understanding of standardisation and regulation in the field of hydrogen and fuel cells in mobility as well as the joint identification of synergies and reciprocal complements in the development of standards and regulations should contribute to a free exchange of products and components. Ultimately, this will strengthen the marketability of zero-emission mobility with hydrogen and fuel cells across the global market.

OVERVIEW OF FUNDING SUPPORT FOR ELECTRIC MOBILITY

Government funding support for New Energy Vehicles (NEV)			
Vehicle type	Electric range R [km], Power P [kW_{el}]	From 23.04.2020	After 2020
BEV	R < 300 km	–	2021: –20 % vs. 2020 2022: –30 % vs. 2021
	300–400 km R	16,200 RMB/vehicle*	
	R > 400 km	22,500 RMB/ vehicle	
PHEV	R > 50 km	8,500 RMB/vehicle	
		Until 22.04.2020	From 23.04.2020
FCEV: Passenger car	P > 10 kW_{el} and R > 300 km	6,000 RMB/ kW_{el} (max. 160.000 RBM/vehicle)	Details not yet public
FCEV: Small buses or trucks	P > 30 kW_{el} and R > 300 km	240,000 RMB/vehicle	
FCEV: Large buses or trucks	P > 30 kW_{el} and R > 300 km	400,000 RMB/vehicle	

RMB = Renminbi

* approx. 7.9 RMB = 1 euro

Correction factors for the energy density of the battery and the energy consumption are applied to BEVs.

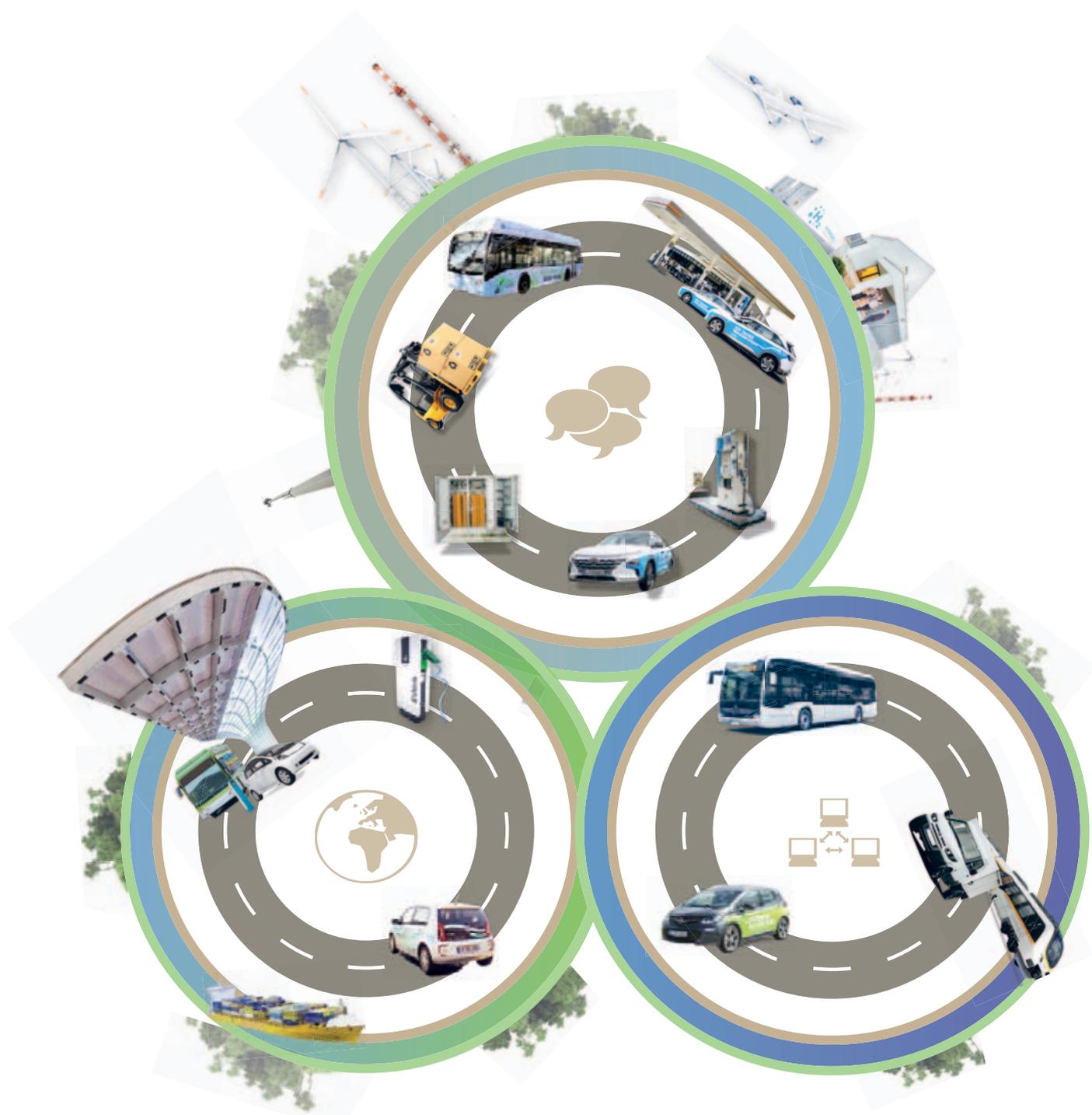
The purchase price before deduction of subsidies may not exceed RMB 300,000 (excluding vehicles with battery replacement systems).

KNOWLEDGE MANAGEMENT

The technological-economic measures coordinated and implemented by NOW GmbH in the various technology areas are supported by targeted media and public relations activities. These are aimed at raising the acceptance and visibility of alternative drives and fuels on a broad scale and promoting the formation and expansion of network groups.

In addition to establishing, maintaining and expanding contacts with the media and the general public, all of NOW GmbH's thematic areas are represented at trade fairs and conferences. Primarily, this concerns the deployment of emission-free mobility and logistics on road, rail, water and air. Complementing the activities are partner workshops, major conferences and other networking events, which provide information on current projects and technology trends.

The Knowledge Management area at NOW GmbH brings together the body of existing programme, project and specialist knowledge, making it accessible and usable for increasing acceptance and visibility, both for sector-relevant specialist networks and for the wider public. Besides many specialist publications, infographics and regularly published statistics provide answers to current questions concerning clean mobility from an expert's perspective.





GERMAN CENTRE FOR CHARGING INFRASTRUCTURE

In January 2020, NOW GmbH was commissioned by the Federal Ministry of Transport and Digital Infrastructure (BMVI – Bundesministerium für Verkehr und digitale Infrastruktur) to establish and operate the German Centre for Charging Infrastructure (NLL – Nationale Leitstelle Ladeinfrastruktur). The centre is to be based at NOW GmbH for the long term, which already also coordinates and manages the BMVI's funding guideline for charging infrastructure. The centre will be built around the existing 'Electric Mobility Infrastructure' area at NOW.

The primary tasks of the centre include the assessment of demand, the planning and coordinated development of a nationwide fast-charging network, the coordination of federal and state activities as well as the support of local authorities in the planning and implementation of charging infrastructure.

The focus is on the expansion of a network for ultra-fast charging in Germany: The first goal is to establish 1,000 new fast-charging locations with a sufficient number of charging points per location, which can also be rapidly expanded. With the 'StandortTOOL' location tool (www.standorttool.de), NOW GmbH has already developed a planning tool on behalf of the BMVI, with which the nationwide charging infrastructure for passenger cars and commercial vehicles can be planned up to the year 2030 and the further expansion requirements assessed. The StandortTOOL identifies the future need for additional charging points and takes into account traffic flows, socio-economic data and existing infrastructure. In addition, new financing instruments will be developed to ensure rapid, reliable and user-friendly expansion. The presence of sufficient charging infrastructure is crucial for consumers' purchasing decisions and thus for the ramp-up of electric mobility.

Zero emission mobility



At present, the development and operation of charging infrastructure is still not very profitable and there are only very few viable business models. Besides locations that will be profitable in the near future due to their favourable location, other sites will continue to be less frequented in the future. However, these are of utmost importance for a nationwide network and for user acceptance. The centre will therefore put larger lots out to tender in which these types of locations are bundled. The federal government will provide start-up funding with a new financing model.

In this context, the German Centre for Charging Infrastructure will also determine by when the charging stations must be installed and how registration and payment should be made. It will also work towards a standardisation of prices and demand consistent and reliable operation. In this way, it provides planning security for charging column users as well as for the electric vehicle manufacturers.

ELECTRIC MOBILITY DEMANDS THE COMMITMENT OF MUNICIPALITIES – NOW GMBH NETWORKS

Electric mobility has the potential to transform the transport system into a more environmentally friendly means of mobility and to improve the quality of life in local communities by reducing local emissions and noise. Accordingly, electric mobility is a key issue in German municipalities: For two-thirds of municipalities, electric mobility is regarded as a high priority, over 80 per cent are active in the area; a further ten per cent are planning activities (results of the 2019 City Survey, NOW GmbH).

The municipalities play an important role in the market ramp-up of electric mobility. Cities and local administrations play a pioneering, example-setting role in the field of electric mobility as they maintain direct contact with their citizens and their local businesses, enabling them to promote and implement electric mobility in various contexts, for example in their own administration or in municipal companies. In addition, they can also create conditions to make electric mobility more attractive for local companies and citizens.

Through collaboration via NOW GmbH's municipal network, the development and expansion of practical expertise on alternative drives and fuels is facilitated. The aim is to provide municipalities with assistance and to offer advice on concrete measures for the development of comprehensive local mobility strategies. Content is drawn from the federal government's support programmes for electric mobility with batteries and fuel cells, charging infrastructure and the mobility and fuels strategy, and is aligned with the specific needs of municipalities. NOW GmbH develops corresponding services, including webinars, workshops and conferences, for the dissemination and discussion of the content and the transfer of knowledge within the network. An additional information service ([↗ www.now-gmbh.de/en/service/infoservice](http://www.now-gmbh.de/en/service/infoservice)) for local municipalities and regions provides information regarding suitable events, important publications, news from the Electric Mobility Starter Set and other useful tools and practical examples.

To complement the NOW GmbH municipal network, regular exchanges with the leading municipal associations – the German Association of Cities ('Deutscher Städtetag'), the German Association of Towns and Municipalities ('Deutscher Städte- und Gemeindebund'), the German Association of Regional Districts ('Deutscher Landkreistag') – as well as with the Association of German Transport Companies ('Verband Deutscher Verkehrsunternehmen') and the Association of Municipal Enterprises ('Verband der kommunalen Unternehmen'), have been established.



The services successfully established as part of the Electric Mobility Starter Sets and the Electric Mobility Roadshow continue to support municipalities on the road to electric mobility.

Starterset Elektromobilität

The Starterset Elektromobilität (Electric Mobility Starter Set), provides practical tips and recommendations on how municipalities and local authorities can become involved in electric mobility and develop it. The Electric Mobility Roadmap and practical modules get you on your way – from the initial idea right through to sustainable integration in cities and municipalities.

➤ www.starterset-elektromobilität.de

Roadshow Elektromobilität

The Federal Ministry of Transport and Digital Infrastructure's Roadshow Elektromobilität (Roadshow on Electric Mobility) tours throughout Germany with an information stand for everyone interested in CO₂-free mobility. It highlights how electric mobility can contribute to climate protection and air pollution control while also discussing opportunities, risks and its suitability for everyday use.

➤ www.roadshow-elektromobilität.de



GERMANY ON THE PATH TO BECOMING HYLAND: REGIONS COMPETE WITH EACH OTHER

The German government aims to cut carbon emissions by up to 95 per cent by 2050 compared to the reference year 1990. In the context of the National Innovation Programme Hydrogen and Fuel Cell Technology (NIP), green, climate-neutral hydrogen is of particular importance. Through a competition initiated by the federal government – and coordinated by NOW GmbH – German regions were invited to play an active role. The funding is specifically intended to motivate municipalities and regions to develop, expand on and implement ideas for integrated hydrogen concepts over a three-phase period. The funding takes into account the different levels of knowledge and experience in the regions. Ultimately, all should have the chance to become a hydrogen region in the short to long term.

The multi-stage funding support spans: 1. Providing assistance for raising awareness of the subject or for the general organisation of the players' landscape (HyStarter); 2. The development of integrated concepts and in-depth analyses (HyExperts); and 3. The implementation of the concepts (HyPerformer).

HyStarters are on their way

From a total of 138 applications, nine regions were selected as so-called HyStarters. These are scattered throughout the country: the Kiel region, Rügen-Stralsund, the Schaumburg district, the Lausitz region, Weimar, the Marburg district, Neustadt an der Waldnaab, Reutlingen and the Ostallgäu region. For one year, the regions or municipalities are provided with substantive advice. They form a landscape of local players in which politicians can be involved as well as municipal companies, industry, business or members of civil society. Together they develop initial concepts for hydrogen and fuel cells based on renewable energies in the transport sector. However, since the integration of the sectors is also becoming increasingly important in view of the climate protection goals, the areas of heating, electricity and storage technologies are also to be addressed.

The selected regions are highly diverse – and that is precisely the reason why they were chosen. For the locations Marburg and Weimar, the focus of the networking activities is on education and knowledge transfer, whereas in Ostallgäu and the district of Schaumburg, the emphasis is deliberately placed on active medium-sized companies. Kiel scores in terms of mobility as a metropolitan region, while Rügen-Stralsund as a coastal region relies on wind power. As a region bordering the Czech Republic, Neustadt an der Wald-

naab emphasises the European network, Reutlingen benefits from its proximity to the automotive industry and the Lausitz region concentrates on structural change towards the use of regenerative sources of energy. A consortium consisting of the companies Spilett, Choice, Becker-Büttner-Held Consulting and EE ENERGY ENGINEERS as well as the non-profit Reiner Lemoine Institute was commissioned to implement the HyStarter project. The kick-off of the project was in September 2019.

HyExperts and HyPerformers

Besides the HyStarters, the HyLand concept also includes the HyExperts and HyPerformer categories. The HyExperts funding support is aimed at regions with some preliminary project experience and knowledge. 13 HyExperts each receive 300,000 euros to develop and calculate concrete project ideas for hydrogen concepts. HyPerformer funding is aimed at regions or regional project consortia that are already in a position to implement their concepts. In this category, the three winning regions each have 20 million euros at their disposal in the form of investment grants for the implementation of pre-existing regional concepts. The total project volume of the three HyPerformers amounts to 195 million euros.



Andreas Scheuer, MdB, Federal Minister for Transport and Digital Infrastructure, announces the winners of the BMVI initiative "HyLand – hydrogen regions in Germany".



The winners in the HyExperts category:

- City of Brake
- District of Emsland
- City of Essen
- City of Frankfurt am Main
- City of Fulda
- City of Ingolstadt
- Lippe District
- District of Oberallgäu
- District of Osterholz
- District of Recklinghausen
- State of Saarland
- City of Ulm
- District of Wunsiedel im Fichtelgebirge

The winners in the HyPerformer category:

- Landshut Region (with the Districts of Munich and Ebersberg)
- Metropolitan Region Northwest (Oldenburg and surroundings)
- Metropolitan Region Rhine-Neckar (surroundings of Mannheim and Heidelberg)



OVERVIEW OF NOW EVENTS



DATE	TITLE/TOPIC	PLACE
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January 2019		
08 – 09 January 2019	Information campaign for the 3 rd call of the BMVI's funding guideline for charging infrastructure	Berlin, Essen, Frankfurt/M, Hanover, Kassel, Kiel, Leipzig, Magdeburg, Mainz, Neuwied, Rostock, Stuttgart, Wolnzach
21 – 22 January 2019	16 th International Congress for Renewable Mobility - Fuels of the Future Event partnership	Berlin
29 January 2019	Handover of funding notices to municipal electric mobility projects within the scope of the "Clean Air Immediate Action Programme 2017–2020" and the federal charging infrastructure programme	Berlin
29 January 2019	Meeting of the Innovative Drives Bus working group	Hanover



In January 2019, the Heidenheimer Verkehrsgesellschaft mbH and Schwarz Logistik GmbH receive notification of funding approval within the framework of the "Clean Air 2017–2020 Immediate Action Programme" in the presence of Roderich Kiesewetter, MdB.



Andreas Scheuer, MdB, Federal Minister of Transport and Digital Infrastructure, at the presentation of funding decisions within the scope of the "Clean Air 2017–2020 Immediate Action Programme".

February 2019		
05 – 06 February 2019	10 th VDV Conference Electric Buses Event partnership	Berlin
26 – 27 February 2019	8 th "Approval – Certification – Standardisation" workshop for fuel cells and hydrogen	Duisburg
27 February – 01 March 2019	FC Expo 2019 – 15 th International Hydrogen and Fuel Cell Expo Tokyo	Tokyo, Japan
28 February 2019	BMVI National Conference on Freight Transport and Logistics	Frankfurt/M



Steffen Bilger, Parliamentary State Secretary at the Federal Ministry of Transport and Digital Infrastructure (pictured right), presents funding decisions during the 6th Specialist Conference on Local Electric Mobility; Moderator: Christian Preiser, Editor-in-Chief of Markt und Mittelstand (left)



Opportunity for networking during a break at the 6th Specialist Conference on Local Electric Mobility



Winfried Hermann, MdL, Minister of Transport of the State of Baden-Württemberg, and Steffen Bilger, Parliamentary State Secretary at the Federal Ministry of Transport and Digital Infrastructure, welcome Prof. Wan Gang, Chairman of the Political Consultative Conference of the People of China, President of the Chinese Society for Science and Technology, Minister of Science and Technology of the People's Republic of China (retired).

March 2019		
13 March 2019	3 rd meeting of the Leasing Task Force	Berlin
21 March 2019	Clean Power Net (CPN) general assembly	Berlin
21 March 2019	H2.0 Conference "Green hydrogen economy in the regions" Event partnership	Husum
26 March 2019	Clean Intralogistics Net (CIN) general assembly	Berlin
26 – 27 March 2019	6 th specialist "Elektromobilität vor Ort" conference on local electric mobility of the Federal Ministry of Transport and Digital Infrastructure	Stuttgart
30 March 2019	Electric Mobility Roadshow Landshut Environmental Fair	Landshut



DATE	TITLE/TOPIC	PLACE
April 2019		
01 – 05 April 2019	Hannover Messe 2019	Hanover
02 – 03 April 2019	MFS Annual Conference 2019	Berlin
08 – 09 April 2019	Future Mobility Summit 2019 – Der Tagesspiegel	Berlin
10 April 2019	9 th Dialogue of the Associations “Alternative Drives, Fuels and Infrastructures for Clean Mobility”	Berlin
10 April 2019	Electric Mobility Roadshow Kick-off event of the Contact and Coordination Office e-mobiles Brandenburg (AK EMO)	Potsdam
11 April 2019	Opening of the H ₂ filling station in Berg bei Hof	Berg bei Hof
24 April 2019	Opening of the Alsterdorf bus depot in Hamburg, Germany’s first depot designed purely for zero-emission buses	Hamburg
27 April 2019	Electric Mobility Roadshow Renewable Energy Day	Stralsund



Hannover Messe 2019: André Steinau (Managing Director GP JOULE), Wolfgang Axthammer (Managing Director NOW GmbH), Bart Biebuyck (Executive Director Fuel Cell and Hydrogen Joint Undertaking FCH JU) (from left to right) welcome the guests of the network reception at the joint stand of NOW GmbH, FCH JU and GP JOULE.



Hannover Messe 2019: Programme Manager Laura Prawatky advises visitors at the NOW GmbH stand.



Thorsten Herbert explains to Bodo Ramelow, Minister President of the Free State of Thuringia, the StandortTOOL location tool, which makes it significantly easier to expand charging infrastructure in line with demand.



The Electric Mobility Roadshow in Vilsbiburg: Tilman Wilhelm, Head of Communications and Knowledge Management at NOW GmbH, hands over the starter set to Mayor Helmut Haider (left) and Regional Manager Georg Straßer (right).

May 2019		
04 May 2019	Electric Mobility Roadshow Environmental Festival with Electric Mobility Day	Kamp-Lintfort
10 May 2019	Opening of the H ₂ filling station in Halle an der Saale	Halle an der Saale
11 May 2019	Electric Mobility Roadshow Mobility Day	Böblingen
14 May 2019	Electric Mobility Roadshow Regional Mobility Transition Conference	Ludwigshafen
16 May 2019	27 th Strategy Circle for Electric Mobility	Berlin
16 May 2019	Electric Mobility Roadshow "Green Mobility" Conference	Neustrelitz
20 May 2019	Electric Mobility Roadshow hanoverimpuls GmbH e-Mobility Info Day	Hanover
19–22 May 2019	32 nd Electric Vehicle Symposium & Exhibition (EVS 32)	Lyon, France
22–23 May 2019	f-cell+HFC – Hydrogen and Fuel Cell Event 2019	Vancouver, Canada
23 May 2019	Closing event of the "Networked Mobility" accompanying research	Berlin
23 May 2019	Closing event of the FastCharge project	Berlin
23 May 2019	GreenTech Festival Introduction StreetScooter REX	Berlin
25 May 2019	Electric Mobility Roadshow Day of Electric Mobility	Vilsbiburg
28–29 May 2019	BMW status seminar on fuel cells and hydrogen technologies	Berlin



DATE	TITLE/TOPIC	PLACE
June 2019		
04 – 06 June 2019	40 th Annual General Meeting of the Deutsche Städtetag Exhibition	Dortmund
05 – 06 June 2019	ANGA COM trade fair Panellists	Cologne
15 June 2019	Electric Mobility Roadshow Experience electric mobility in the Middle Rhine region	Boppard
18 June 2019	Opening of the H ₂ filling station in Dusseldorf South	Dusseldorf
23 June 2019	Electric Mobility Roadshow Straßenland	Cologne
24 June 2019	Opening of the H ₂ filling station in Siegen	Siegen
23 – 28 June 2019	NRW Hydrogen Week	
26 – 27 June 2019	11 th Wind Energy Industry Day NRW Exhibition	Cologne



NOW GmbH provides information about alternative drives and fuels during the 40th Deutscher Städtetag.



Ullrich Sierau, Lord Mayor of the City of Dortmund, and Markus Lewe, Lord Mayor of the City of Münster and President of the German Association of Cities and Towns, together with Tilman Wilhelm from NOW GmbH, invite regions to apply for the BMVI “HyLand – Hydrogen Regions in Germany” funding initiative.

July 2019		
06 July 2019	Electric Mobility Roadshow Electric Mobility Day at the Technology Center for Future Energies	Lichtenau
10 July 2019	Webinar Local electric mobility – fields of action and support for municipalities	
24 July 2019	Closing meeting of the “Networked Mobility” thematic area	Berlin

August 2019		
08 August 2019	Opening of the H ₂ filling station in Brunsbüttel	Brunsbüttel
16 August 2019	Electric Mobility Roadshow E-Mobility Practice Forum 2019	Strausberg
17 – 18 August 2019	Open Day of the Federal Government Exhibition at the Federal Ministry of Transport and Digital Infrastructure	Berlin
24 August 2019	Electric Mobility Roadshow Springe Climate Protection Day	Springe
27 August – 25 October 2019	Information campaign for the 4th call for charging infrastructure funding support	Bad Salzungen, Berlin, Dresden, Emden, Fulda, Koblenz, Neustadt a. d. Weinstraße, Oschersleben, Saarlouis, Stralsund, Warstein



Achim Wehrmann, Head of the Sub-Division WS 2 Shipping of the Federal Ministry of Transport and Digital Infrastructure, in an exchange with an audience of experts at the “Zero Emission Shipping – Alternative Marine Fuels and Future Maritime Energies” symposium.

Thorsten Herbert, NOW GmbH, provides an overview of the Federal Government’s support measures coordinated by NOW GmbH in the field of alternative propulsion systems and fuel infrastructure in shipping.

September 2019		
01 September 2019	Electric Mobility Roadshow Bridge Festival	Wetzlar
03 September 2019	ENERGIEFORUM “Climate-friendly on the move – sustainable mobility for business trips” Event partnership	Oschersleben
04 September 2019	NOW Symposium “Zero Emission Shipping - Alternative Marine Fuels and Maritime Future Energies”	Hamburg
05 September 2019	8 th Sino-German conference on the implementation of the “Green Logistics” action plan	Berlin
05 September 2019	ZOOM – The Clean Mobility Expert Arena on the subject of Power-to-X & Sector Coupling	Berlin
08 September 2019	Electric Mobility Roadshow Electric Mobility Day	Rietberg
10–11 September 2019	f-cell 2019 – The Impulse Summit for Hydrogen and Fuel Cells	Stuttgart
10–11 September 2019	watt_2.0-Forums (as part of the Husum Wind trade fair)	Husum
14 September 2019	Electric Mobility Roadshow Saarland full of energy	Saarlouis
17 September 2019	5 th Supplier Marketplace Hydrogen and Fuel Cell Technology	Berlin
22 September 2019	Electric Mobility Roadshow Day of Action of the City of Mönchengladbach	Mönchengladbach
27 September 2019	Electric Mobility Roadshow Sustainable Mobility	Göppingen



5th Supplier Marketplace Hydrogen and Fuel Cell Technology

Wolfgang Axthammer, Managing Director of NOW GmbH, welcomes the participants to the 5th Supplier Marketplace Hydrogen and Fuel Cell Technology.



Andreas Scheuer, MdB, Federal Minister of Transport and Digital Infrastructure, presents innovative hydrogen projects with future cheques totalling some 23.5 million euros.

DATE	TITEL/THEMA	PLACE
October 2019		
02 October 2019	Handover of the funding notice for the HyBat-Truck project with Enak Ferlemann, Parliamentary State Secretary at the Federal Ministry of Transport and Digital Infrastructure	Winsen/Luhe
14 October 2019	Press excursion Baden-Württemberg	Stuttgart
15 October 2019	Signing of a Memorandum of Understanding between the Federal Ministry of Transport and Digital Infrastructure (BMVI) and the Ministry of Science and Technology of the People’s Republic of China (MOST)	Berlin
15–17 October 2019	emove360° – Trade Fair for Mobility 4.0 – Electric Mobility, Networked & Autonomous Driving	Munich
18 October 2019	Federal Minister of Transport and Digital Infrastructure Andreas Scheuer hands over so-called “cheques for the future” for hydrogen vehicles	Berlin
16 October 2019	Presentation of the special prize for Hydrogen, Fuel Cells and Battery Electric Drives to the 2018/2019 NOW national winner	Munich
20 October 2019	Electric Mobility Roadshow Electric Mobility Mile at the Nienburg Auto Show	Nienburg
23–24 October 2019	International Hydrogen Symposium 2019 of IHK Nord e. V. Event partnership	Hamburg
24 October 2019	Fuel Cell Forum Hesse 2019 Event partnership	Stockstadt am Rhein
29 October 2019	2 nd IBZ Fuel Cell Innovation Forum Event Partnership	Frankfurt/M
29 October 2019	Opening of the H ₂ filling station in Bad Homburg	Bad Homburg
31 October 2019	Start of scheduled operations for the BOB Solingen trolleybus	Solingen

November 2019		
04 November 2019	Keel laying of the emission-free ELEKTRA push boat	Berlin
05 November 2019	Hydrogen and the energy system transition – Stakeholder conference on the National Hydrogen Strategy	Berlin
06 November 2019	28 th Strategy Circle for Electric Mobility	Berlin
06 November 2019	CEP Annual Conference Event partnership	Hamburg
07 November 2019	Electric Mobility Roadshow H2 mobility in company fleets and commuter transport	Dusseldorf
07 November 2019	CPN Workshop: “Planning and deployment of secure power supplies with fuel cell systems – innovative, energy-efficient and low CO ₂ emissions”	Berlin
11 November 2019	4 th SGEN Steering Committee Meeting	Berlin
12 November 2019	CIN Symposium 2019	Leipzig
14 November 2019	Electric Mobility Roadshow Fuel of the future – (green) hydrogen is mobilising rural areas	Lengerich
22 November 2019	Opening of the H ₂ filling station in Passau with Andreas Scheuer, Federal Minister of Transport and Digital Infrastructure	Passau
25 November 2019	Parliamentary evening of the CEP and DWV in cooperation with DVGW “Hydrogen Industry Strategy 2030” Event partnership	Berlin
28 November 2019	Meeting of the Airports working group	Berlin



Andreas Scheuer, MdB, Federal Minister for Transport and Digital Infrastructure, opens the first hydrogen filling station in Passau, Lower Bavaria.

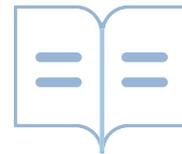


Germany on its way to becoming hydrogen country: The winners of the BMVI “HyLand - Hydrogen Regions in Germany” initiative.

December 2019		
11 December 2019	2 nd NOW Urban Commercial Transport workshop	Berlin
12 December 2019	Announcement of the 16 winners of the BMVI initiative “HyLand – Hydrogen Regions in Germany” in the categories HyExperts and HyPerformers by Federal Minister of Transport and Digital Infrastructure Andreas Scheuer	Berlin
13 December 2019	3 rd leasing dialogue process	Berlin

The list includes events organised and conducted by NOW GmbH as well as events in which NOW GmbH was involved in the organisation and running of.

NOW PUBLICATIONS IN 2018

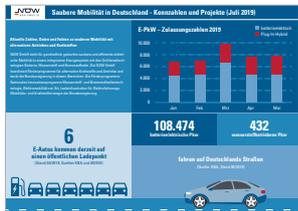


NOW issued numerous new publications in 2019, either individually or in cooperation with partners.

The publications include the annual report and reports on results, studies, funding programme-specific information brochures as well as guidelines and manuals for the four programme areas National Innovation Programme Hydrogen and Fuels Cell Technology (NIP), Charging Infrastructure (LIS – Ladeinfrastruktur), Local Electric Mobility (Elektromobilität vor Ort) and the Mobility and Fuel Strategy (MFS (Mobilitäts- und Kraftstoffstrategie – MKS).

All the publications are available in German and many in English. They can be downloaded from the website:

- www.now-gmbh.de/en/service/publications (English)
- www.now-gmbh.de/de/service/publikationen (German)



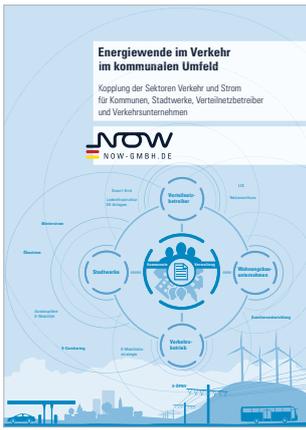
Clean mobility in Germany – Key figures and projects (July 2019)
Folder



ZOOM Impulse sheet Infrastructure for alternative fuels
Folder



Electric mobility: Government programmes, laws and regulations
Legislative map



The energy transition in transport in the municipal context | Coupling the transport and electricity sectors for municipalities, municipal utilities, distribution network operators and transport companies
Brochure



Coordination and communication processes for the municipal implementation of electric mobility | Practice-oriented guide for the design of governance at various levels
Brochure



Promotion of electric mobility by anchoring it in municipal mobility strategies | Established conceptual approaches and detailed collection of targets and measures
Brochure



Electric mobility in German municipalities | Taking stock
Brochure



Legal framework for an integrated energy concept 2050 and the integration of renewable fuels
Brochure



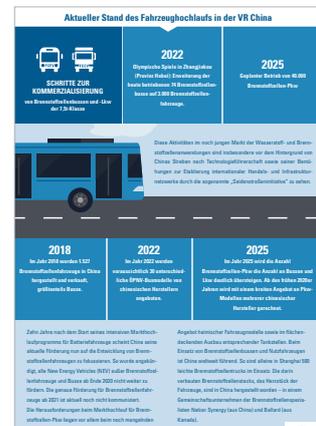
Framework conditions and market | Local and international comparison of electric mobility
Brochure



Electric mobility | Mobility with batteries and fuel cells
Brochure



NOW Annual Report 2018
Brochure



Hydrogen and fuel cell technology in the People's Republic of China
Factsheet

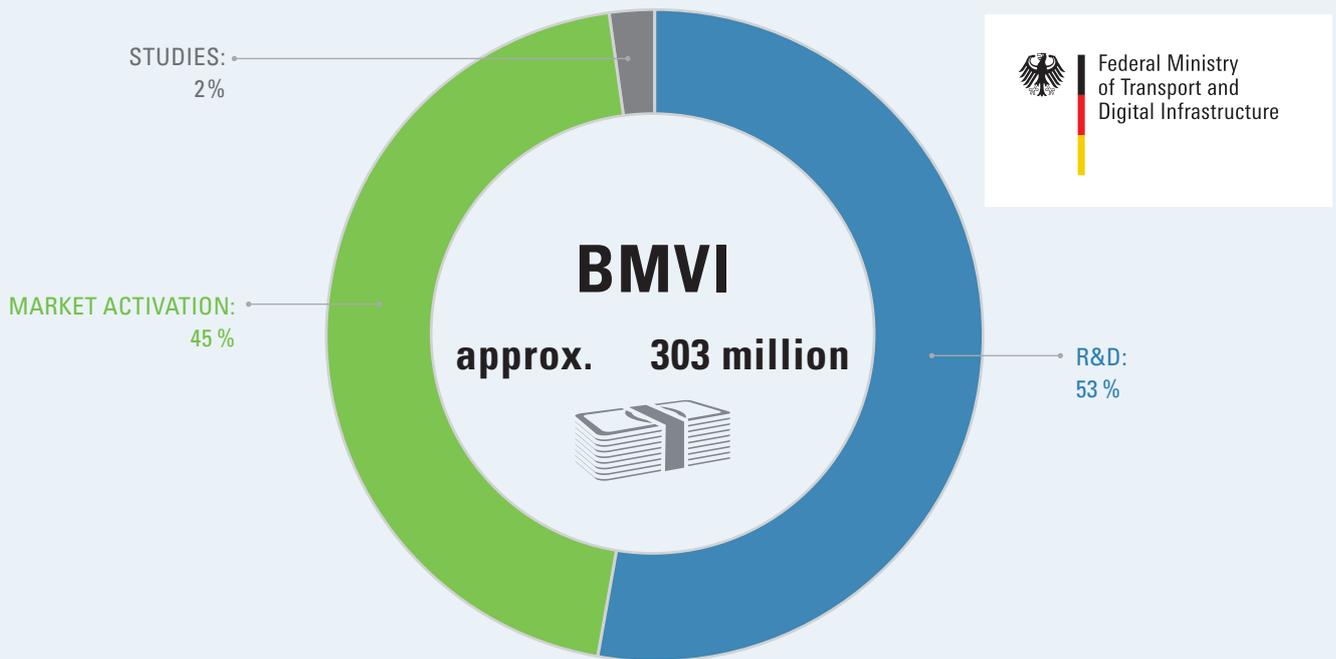
I. NIP – FEDERAL FUNDING HYDROGEN AND FUEL CELLS



NIP

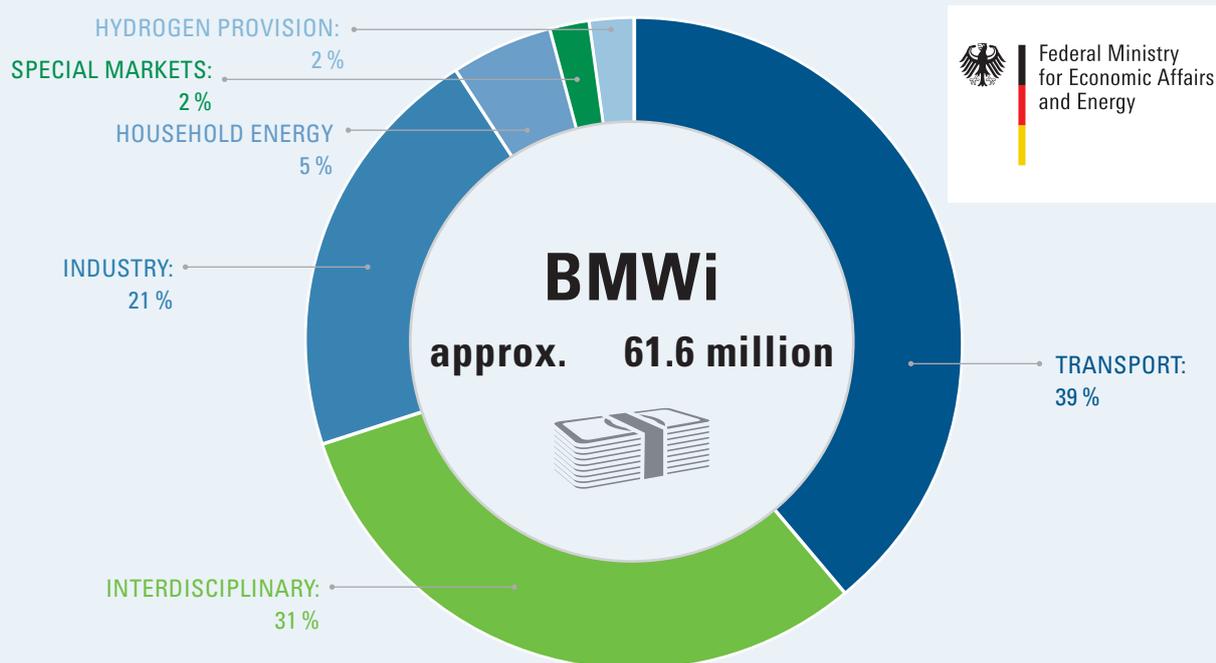
To accelerate the market maturity of hydrogen and fuel cell technologies in different application areas, in 2006 the federal government, federal states, industry and science launched the ten-year National Innovation Programme Hydrogen and Fuel Cell Technology (NIP), which had a funding volume of 1.4 billion euros. The federal cabinet adopted the hydrogen and fuel cell technology governmental programme in September 2016 for the period of 2016 to 2026. This signalled the second phase of the successful NIP (NIP II). The continuation of the inter-ministerial programme ensures research and development continuity and through the corresponding product developments, supports market activation. In this second phase, the Federal Ministry of Transport and Digital Infrastructure (BMVI) is initially allocating 250 million euros by 2019 to implement the programme in support of hydrogen and fuel cell technology. The Federal Ministry for Economic Affairs and Energy (BMWi) is continuing its funding of hydrogen and fuel cell technology in the area of applied research and development under the 6th Energy Research Programme with around 25 million euros annually. Furthermore, in August 2016, the BMWi set up a funding programme for the procurement of fuel cell heating systems for private customers within the framework of the National Energy Efficiency Action Plan (NAPE). The federal ministries for the Environment, Nature Conservation and Nuclear Safety (BMU) as well as Education and Research (BMBF) are actively involved in the strategic shaping of NIP, as was already the case during the first NIP phase via the structures of NOW GmbH.

APPROVED PROJECTS 2019



AREAS	FUNDING AMOUNT/€
R&D	160,094,043
MARKET ACTIVATION	137,061,464
CLUSTER MANAGEMENT	516,741
STUDIES	5,365,875
TOTAL	303,038,123

APPROVED PROJECTS 2019



AREAS	FUNDING AMOUNT/€
TRANSPORT	24,025,055
INTERDISCIPLINARY	19,083,790
INDUSTRY	12,844,734
HOUSEHOLD ENERGY	2,835,786
SPECIAL MARKETS	1,537,597
HYDROGEN PROVISION	1,333,231
TOTAL	61,660,193

Source: PtJ end-of-year figures 2019



Federal Ministry
for Economic Affairs
and Energy

THE FOLLOWING PROJECTS WERE APPROVED IN 2019 UNDER THE BMWi FUNDING PRIORITY OF THE NIP

PROJECT	PROJECT START	PROJECT END	FUNDING AMOUNT [€]	PARTNERS
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PROJECT	PROJECT START	PROJECT END	FUNDING AMOUNT [€]	PARTNERS
SOFC-Units	01.12.2019	30.11.2022	5,241,470	Robert Bosch GmbH
CoBIP	01.12.2019	30.11.2022	77,883	e.GO REX GmbH
	01.12.2019	30.11.2022	504,823	Forschungszentrum Jülich GmbH
	01.12.2019	30.11.2022	1,533,512	Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V.
	01.12.2019	30.11.2022	205,673	Matthews International GmbH
	01.12.2019	30.11.2022	230,881	Precors GmbH
H ₂ -Control	01.12.2019	30.11.2022	604,353	Esters Elektronik GmbH
	01.12.2019	30.11.2022	440,055	Technische Universität Darmstadt
HTPEM2	01.01.2020	31.12.2022	1,210,605	DLR-Institut für Vernetzte Energiesysteme e. V.
	01.01.2020	31.12.2022	305,288	fischer eco solutions GmbH
	01.01.2020	31.12.2022	183,003	Trigona GmbH
InduREX	01.11.2019	31.10.2022	2,679,167	e.GO REX GmbH
	01.11.2019	31.10.2022	610,003	Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V.
	01.11.2019	31.10.2022	310,219	Rheinisch-Westfälische Technische Hochschule Aachen
	01.11.2019	31.10.2022	1,695,271	Zentrum für Brennstoffzellen-Technik GmbH
Innopire	01.12.2019	31.05.2022	802,043	Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V.
	01.12.2019	31.05.2022	737,296	Siqens GmbH
PAULL	01.12.2019	30.11.2022	2,855,425	Freudenberg Sealing Technologies GmbH & Co. KG
	01.12.2019	30.11.2022	571,848	Max-Planck-Institut für Eisenforschung
	01.12.2019	30.11.2022	300,281	Universität Stuttgart
BRYSON	01.12.2019	31.05.2023	717,352	Bayerische Motoren Werke AG
	01.12.2019	31.05.2023	144,871	Hochschule für angewandte Wissenschaften München
	01.12.2019	31.05.2023	349,810	WELA Handelsgesellschaft mbH
DirectSTACK	01.02.2020	31.01.2023	1,255,650	ElringKlinger AG
	01.02.2020	31.01.2023	950,604	ElringKlinger Kunststofftechnik GmbH
	01.02.2020	31.01.2023	1,580,923	Hahn-Schickard-Gesellschaft für angewandte Forschung e. V.
	01.02.2020	31.01.2023	126,263	Jakob Weiß & Söhne Maschinenfabrik GmbH
Total			26,224,572	

PROGRAMME AREA: ■ INDUSTRY ■ INTERDISCIPLINARY ■ TRANSPORT AND INFRASTRUCTURE





MARKET ACTIVATION

Apart from research and development, market activation is paramount. Funding market activation projects (as a precursor to the market ramp-up) applies to products that have achieved technological market maturity, but are not yet competitive on the market. The lack of competitiveness is on the one hand, due to too high production costs and on the other, a lack of infrastructure for fuel supply and maintenance. The focus of the funding is not on individual private customers but rather on commercial application and the associated quantities.

Approved projects BMVI 2019

AREAS	FUNDING AMOUNT/€
INFRASTRUCTURE	26,499,825
RAIL	13,887,120
BUS	7,872,686
INTRALOGISTICS	2,368,628
PASSENGER VEHICLES	1,528,419
TOTAL	52,156,678

Rail

Electrifying rail routes requires considerable effort and more importantly, major investment, which is why today approx. 40 per cent of the German rail network is operated with diesel trains. For the routes where electrification is not economically justifiable, even over the next few decades, hydrogen trains represent a zero CO₂ and particulate-emission alternative, which is virtually noiseless. Under the NIP, there are already two subsidised projects to develop hydrogen trains by rail manufacturers Alstom and Siemens. So as to advance the market entry of these trains, in 2017 the first funding call for the procurement of hydrogen trains was launched and garnered great interest. The investment funding of 14 Coradia iLint trains, amounting to approx. 8.4 million euros, was already approved in 2018. The trains will be deployed from the spring of 2022 on the Cuxhaven-Bremerhaven-Bremervörder-Buxtehude route by LNVG (Landesnahverkehrsgesellschaft Niedersachsen – Lower Saxony’s state transport company). Furthermore, funding of approx. 14.7 million euros has been allocated to the RMV (Rhein-Main-Verkehrsverbund – public transport network of the Frankfurt Rhine-Main area) for the procurement of 23 hydrogen trains for use on the 11, 12, 15 and 16 RMV lines in the Frankfurt region from the end of 2022. In 2019, funding applications were finally approved for the required associated hydrogen infrastructure by Infraser GmbH und Co. Höchst KG (Hesse) as well as Linde Gas Produktionsgesellschaft mbH & Co. KG (Lower Saxony). In order to be able to satisfy the huge interest in emission-free trains overall, a new cross-technology budget title: ‘Subsidies to support alternative drives in rail transport’ was incorporated into the 2019 budget, which has been allocated 13.9 million euros and as well as commitment appropriations for the following years up until and including 2024, totalling 38.75 million euros.



Since 2018, the regional public transport company of Lower Saxony (LNVG – Landesnahverkehrsgesellschaft Niedersachsen) has deployed two Coradia iLint local trains with hydrogen fuel cell drives. In the first six months of operation in 2019, the trains covered 100,000 km: quietly, without emissions and reliably.





Fuel cells in use: 70 hydrogen-powered tow trains (indoor tractors) from Linde take care of the intralogistics at the BMW plant in Leipzig.

Call for applications for funding publicly accessible hydrogen refuelling stations in road transport [05/2019] – deadline 31.07.2019



Road transport hydrogen infrastructure

Hydrogen and fuel cells are cornerstones on the path to medium towards long term emission-free mobility in Germany. Expansion of the hydrogen refuelling station infrastructure is therefore a high priority for the federal government. As laid out in the National Strategic Framework on the implementation of the EU directive on the deployment of alternative fuels infrastructure (AFID), the federal government is aiming for 100 hydrogen refuelling stations nationwide by the end of 2020. Further expansion of the H₂ refuelling station network will take place depending on the vehicle ramp up or the existing demand for hydrogen in the region through the relevant mobile applications with fuel cells. In future there could potentially be hydrogen refuelling stations with a higher refuelling capacity, filling up to 150 cars per day and for specific locations, also for refuelling light and heavy-duty commercial vehicles. In the first funding call in 2018 for public hydrogen refuelling stations in NIP II, a total of 20 refuelling stations and three electrolyzers were approved for a total of 20 million euros. Through Art. 56 AGVO under the call, investments for the construction of public hydrogen refuelling stations are funded with 60 per cent of costs over the life cycle of the facility. Furthermore, operational costs are eligible for funding. Electrolysers for the generation of hydrogen from renewable energies to supply the refuelling stations are eligible for funding (Art. 36 AGVO, 40 per cent of the added investment costs). The funding of refuelling station infrastructure is a priority of the National Innovation Programme Hydrogen and Fuel Cell Technology (NIP). The second call – funding publicly accessible hydrogen refuelling stations in road transport – ended on 31 July 2019 and also attracted huge interest. In the first NIP phase (2006-2016), 50 public hydrogen refuelling stations were funded for cars. Of the 82 refuelling stations operating as of February 2020, 77 are run by the industry joint venture H2 MOBILITY.

Call for applications for funding fuel cell systems for autarchic energy supply of critical or off-grid infrastructures – deadline 30.05.2018.



Uninterruptible power supply

In the event of a catastrophe in Germany, power failure might also be a issue. But it is precisely during a catastrophe situation that the functioning of certain critical infrastructure is particularly important. This applies to for example, the digital radio for public safety authorities and organisations (BOS), used for communication by the police and fire services, among others. Fuel cell technology can fully utilise its advantages as a substitute power supply to secure radio sites for BOS digital radio, as it is highly reliable and environmentally-friendly, can be maintained remotely and, in contrast to diesel generators, does not incur fuel degradation, even with long downtimes. Following successful R&D projects in several federal states under NIP I, 505 additional systems in Bavaria, Baden-Württemberg, Brandenburg, Hesse and Saxony were approved with a funding amount of around 5.2 million euros over the course of market activation. With the successful completion of the calls for tender in the individual federal states 2018/2019, project implementation was able to begin locally.

In future, aside from BOS digital radio, increasing quantities of fuel cells will be seen also for other application areas such as traffic management systems, data centres or industrial plants, as off-grid or uninterruptible power supplies.

Call for applications for funding fuel cell vehicles in local public transport and in fleets – deadline 30.06.2018.



Passenger vehicles

The introduction of fuel cell drives in cars is one of the aims of the federal government in order to achieve the specified CO₂ reduction goals and to increase the efficiency of the drive train in cars, light commercial vehicles and other vehicle categories, particularly in local public transport. As a future contributor to environmentally-friendly and sustainable energy supply, fuel cell vehicles are an integral part of the energy concept of the federal government. This type of drive substantially reduces noise emissions and eliminates local emissions. Assuming an average driven distance of 12,000 kilometres per year and a CO₂ output of 95 g/km (EU target value), using renewable energy hydrogen equates to an annual CO₂ reduction of 1.14 t per vehicle. In the second call which followed the 2017 call, 319 vehicles were applied for, of which 225 were already approved in the amount of 3.35 million euros. Funding approvals for 319 vehicles were issued in another call in 2018. In 2019, yet another funding call was launched (in the fourth quarter).



Emission-free mobility in daily life: one of 82 hydrogen stations operated by H2 MOBILITY (as at February 2020)



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Tanken dauert
5-8 Min. für
eine Reichweite
von 300 km

H₂



Buses

It is not just the cut in greenhouse gas emissions, but also now the reduction of particulate matter pollution in German cities and municipalities that is one of the key drivers for implementing alternative drives in local public transport.

Fuel cell buses are enjoying increasing interest because of their higher ranges and shorter refuelling times compared to battery buses. Already at the end of 2017, the first funding call for hydrogen bus procurement was issued as well as the associated infrastructure (for a fleet of upwards of ten buses). The funding for a total of 51 fuel cell buses was already assured under this framework. They are currently being procured and will shortly begin operation. In order to support a continual increase in fuel cell bus fleets in Germany, in 2018 another funding call was published, under which applications for a total of 33 buses were received. Two buses were approved under the eFarm project in 2018, with another 31 following on in 2019. Of these, 20 vehicles are going to Regionalverkehr Köln Gesellschaft mbH (RVK) and 10 to Wuppertaler Stadtwerke mobil GmbH (WSW) to reinforce the total of 40 buses already approved in the first funding call, as well as one fuel cell bus to Cottbusverkehr GmbH.

In an effort to further drive forward the use of fuel cell buses in local public transport, since the spring of 2019 NOW GmbH is financing the German fuel cell bus cluster. Originally established in 2015 in the framework of EU initiative: Fuel Cell and Hydrogen Joint Undertaking (FCH JU), it was tasked with coordinating the procurement projects of German, Swiss, Austrian and South Tyrolean bus fleet operators which are funded in the framework of the EU funding programme JIVE. However, the second phase of the JIVE II programme heralded the expiration of the Cluster's remit at the end of 2017. The new German fuel cell bus cluster, which connects bus fleet operators, advises them in the procurement of fuel cell buses and the necessary hydrogen infrastructure as well as initiates exchange between operators and vehicle manufacturers, is seen as a valuable platform for establishing fuel cell buses in Germany both by NOW GmbH as well as by the stakeholders involved, and will therefore continue to serve as an important access point for interested players.

Call for proposals for funding industrial truck fleets with fuel cell drives – deadline 30.04.2019.



Intralogistics

There is hardly an economic sector that has shown as much growth over recent years as intralogistics, which is not least attributable to the online boom and an increase in the global flow of goods. Aside from performance challenges, this growth brings with it a great responsibility to adopt a climate-friendly approach for the sector. Industrial trucks with fuel cell drives can represent a suitable alternative to conventional drives in this regard.

The market introduction and penetration of fuel cell industrial trucks and airport apron towing tractors as well as hydrogen infrastructure is supported in the framework of market activation under NIP II because this technology has many advantages. Industrial trucks with fuel cell technology can achieve significant CO₂ savings in logistics – short refuelling times ensure a considerable increase in productivity and there is no longer a need for the provision of valuable logistics space for battery changes.

In this way, the strengths of fuel cell technology come into their own, particularly in the transport of heavy loads in intralogistics or in freight transport.

Following the successful R&D and demonstration activities at the BMW plant in Leipzig, as well as at the Mercedes Benz plant in Düsseldorf, a good 150 extra industrial trucks could be fitted out with fuel cells at five locations under the first funding call. 3.4 million euros in total were allocated for the associated development of refuelling infrastructure as well as an electrolysis facility for the on-site production of hydrogen. Of the 3.4 million euros, 2.4 million was granted in 2019.





A joint order placed by Regionalverkehr Köln GmbH (RVK) and Wuppertaler Stadtwerke (WSW) with Van Hool includes "40 New A 330 FC" fuel cell buses. Since January 2020, RVK has been operating the fuel cell buses in regular service to Cologne/Bonn Airport

RESEARCH AND DEVELOPMENT (R&D)

An important pillar in NIP continues to be the funding of research, development and innovation. In general, the application areas of NIP are diversified and include vehicles and infrastructure for road and rail transport, shipping and aviation. In implementing individual measures, it is important to ensure the interlinking of players across industry sectors, e.g. in the context of innovation clusters, so that overarching issues can continue to be worked on together, accompanied by independent scientific accompanying research.

Reflecting the industrial-political nature of NIP, within the individual measures, the added value in Germany and in Europe in the technological field of hydrogen and fuel cells must be built upon and reinforced. This requires an internationally competitive supplier industry, particularly for key components like fuel cell stacks or electrolysis.



The main laboratory of the Center for Fuel Cell Technology (ZBT – Zentrum für BrennstoffzellenTechnik) in Duisburg.

TRANSPORT AND INFRASTRUCTURE

The aim of the transport and infrastructure measures within NIP is to establish hydrogen and fuel cells competitively on the market over the coming years. This includes the further development of on-board technologies and systems as well as the necessary infrastructure, also in the market ramp-up phase.

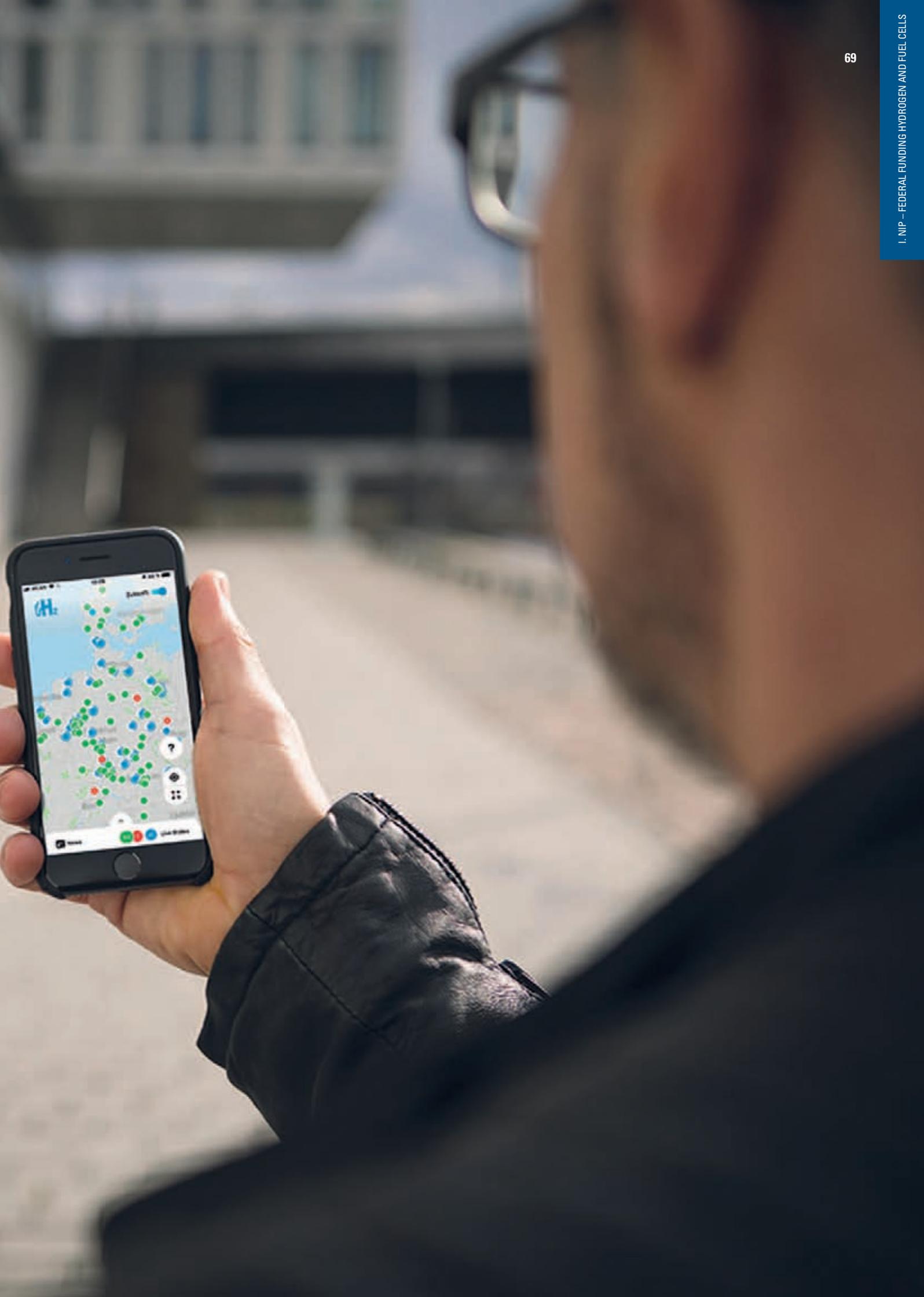
An important pillar in NIP therefore continues to be the promotion of research, development and innovation. In principle, the areas of application of NIP are broad and include vehicles and infrastructure for road transport, rail, shipping and aviation. In implementing the individual measures, it is important to ensure the networking of stakeholders across industrial sectors, e.g. within the framework of innovation clusters, so that overarching issues continue to be addressed jointly, flanked by independent accompanying scientific research.



No emissions, fast refuelling and long range are among the key benefits of fuel cell vehicles.



H2 MOBILITY is establishing a nationwide network of hydrogen filling stations throughout Germany. An app supports in the planning of routes.





Refuelling for more range: hydrogen fuel pump for fuel cell passenger cars.



Passenger vehicles

Electric mobility with batteries and fuel cells is a fundamental component of sustainable mobility. NIP pursues the goal of establishing fuel cell passenger vehicles as part of the future vehicle portfolio. Fuel cell vehicles already exhibit a marketable technical performance capability and service life. They offer customers the usual short refuelling times and long ranges. However, further optimisation is needed, particularly in order to achieve competitive manufacturing costs. Economies of scale contribute to this through greater unit numbers. In addition, the further development of cost-effective materials for the different stack and system components, as well as optimised system technology, are necessary.



Components and systems

The manufacturers of hydrogen and fuel cell products now have the joint task of making the German (supply) industry successful through a continuous further development of products, subsystems and components along the value-added chains on the German and international markets. In addition to improved materials, power density and long-term stability, major hurdles include the costs of fuel cells and overall systems, in particular with regard to the preparation of an efficient, and thus cost-efficient, series production in high unit numbers.

In service with Regionalverkehr Köln GmbH (RVK) since January 2020: "Van Hool New A 330 FC" fuel cell buses.





Buses

The interest in buses with emission-free drives is continuing to grow sharply. An alternative to battery vehicles, fuel cell buses can be sensibly used primarily for long journeys requiring a long range capability as well as in topographically challenging areas, such as medium mountainous regions. Furthermore, short hydrogen refuelling times mean that only minor modifications are necessary for bus fleet operators compared to normal operation with diesel buses. It is precisely the latter point that plays a major role in local public transport because of high customer demand in terms of reliability and punctuality of the transport service.

In order to satisfy increasing vehicle demand, in 2019 the ECellRex project by Evo Bus GmbH was approved which sought to develop an electric bus with fuel cell range extenders. Fuel cell range extenders offer the option of combining the advantages of batteries and fuel cell vehicles flexibly. In this way, the vehicle can not only be charged with electricity in a highly efficient manner, but also refuelled with hydrogen to achieve longer ranges. The concept is mainly appealing to bus fleet operators, striving for a combination of battery and fuel cell vehicles within their fleet and thus wishing to install a refuelling and charging infrastructure anyway.



Heavy commercial vehicles

Converting to alternative drives and emission-free transport brings its own special set of challenges to heavy goods vehicle traffic in particular. They are mainly characterised by the strict vehicle specifications in terms of weight and dimensions as well as the high frequency use of the vehicles in extra-urban and urban freight transport. Hydrogen fuel cell systems can let their strengths come to the fore here: a long range and high performance at a low vehicle empty weight and short refuelling times compared to battery drives. Aside from greenhouse gas emissions, particulate matter pollution plays an especially significant role in urban delivery traffic as well as in waste management and disposal services. Using fuel cell vehicles can substantially reduce this, thus making a big contribution towards better air quality in cities.

The range of trucks with this type of drive is still limited, despite high demand. This makes the launch of the FC-Truck project for the development of a tractor unit with a fuel cell drive and an appropriate infrastructure solution all the more welcome. The funding of the project by MAN Truck & Bus SE, Shell Oil Deutschland GmbH, Anleg GmbH as well as the Technische Universität Braunschweig was earmarked in October 2019, the latter consortium partner received the subsidy note in 2019.

The development of suitable hydrogen infrastructure for long-haul road freight transport represents a special challenge which was discussed in 2019 in the framework of diverse initiatives on national – in particular in the context of a cooperation with the Clean Energy Partnership (CEP) – and international levels (FCH JU, Hydrogen Europe, etc.). The evaluation of different refuelling pressure levels, the necessity of suitable components (on the vehicle as well as on the infrastructure side) and the provision of the required hydrogen quantities still provide ample scope for development and action for the coming decade.





Maritime applications

In ships, fuel cells can be used for on-board power supply, but also for propulsion in hybridised systems. Aside from high efficiency and low emissions, other features of fuel cells play an important role in shipping. The decentralised design option on the vessel provides a major efficiency advantage, as the use of space can be optimised. On passenger ships, low noise and low vibration operation is a benefit for customers. As a combustion fuel, fuels that are available now can quickly be reverted to (LNG, diesel, methanol), but also electricity-based fuels (hydrogen, synthetic fuels, etc.) can be used. They must play a bigger part in shipping in future. Within the e4ships lighthouse project, the function of fuel cells on ships was successfully demonstrated in NIP I. In the continuation of NIP, the demonstrators developed there will be brought forward to market readiness and the development of necessary rules will be advanced on international levels.

The port of Hamburg is the largest seaport in Germany, the volume of seaborne goods handled rose to 136.6 million tonnes in 2019 and container handling reached 9.3 million TEU (Twenty-foot Equivalent Units).



In 2019, the ELEKTRA, the world's first emission-free canal push boat, was launched. Equipped with a hydrogen fuel cell drive, the push boat will transport freight for BEHALA quietly and without emissions on the Havel and Elbe rivers between Hamburg and Berlin.



BEHALA



HYDROGEN PROVISION

In the hydrogen provision programme area of NIP, demonstration projects, research and development projects as well as studies on the manufacture, storage and distribution of hydrogen are funded. In accordance with energy concept targets, hydrogen will be mainly produced from renewable energies – wind and solar power as well as biomass. Hydrogen will be used as a fuel for fuel cell vehicles and as storage for the absorption of larger amounts of fluctuating renewable energies. Concrete applications also include stationary reconversion to electricity, feeding into the gas grid as well as use as climate-neutral industrial gas.

Using regenerative hydrogen can contribute significantly to achieving the goals of the energy transition. Firstly, the replacement of fossil fuels with renewable energies in the transport and the energy sectors will be advanced. Secondly, energy storage capacities will be created, which are urgently needed for the success of the energy transition. The particular economic appeal of hydrogen as a fuel facilitates the establishment of a leading market, which paves the way for energy storage and other applications. Technologically speaking, hydrogen production by means of highly efficient water electrolysis, above all based on surplus wind power, forms the core of the programme area. Water electrolysis is a key technology for the integration of renewable energies in the transport and energy industries. Growing and newly-existing markets for hydrogen create the prerequisite for exploiting substantial development potential for all available electrolysis technologies.

While it is still true that tried and tested alkaline electrolysis is currently mainly used, the technologically younger polymer electrolyte membrane (PEM) electrolysis is rapidly gaining ground. Demonstration projects on both technologies are being funded in the programme area.

Aside from the established technologies of alkaline and PEM electrolysis, high temperature electrolysis is now also being commercially deployed. The aim of the NIP activities is to achieve commercial operation of all three technologies. This enables an efficient use of water electrolysis systems for all application scenarios in future.

The efficiency of hydrogen electrolysis systems is necessary in order to be able to exploit the advantages of hydrogen in the energy system and thus achieve the decarbonisation of the sectors. The potential of hydrogen and fuel cell technologies for the energy transition is being discussed in studies and analyses. The results help with the classification of the projects and of other activities in the NIP, and more specifically the effects they have on the energy transition.

SPECIAL MARKETS

In terms of NIP II, the term ‘Special markets’ largely comprises both the following areas of activity:

- Business power supply (emergency power supply, UPS, off-grid power supply, autarchic/hybrid power supply, emergency power systems, e.g. in the areas of telecommunications, information technology, traffic management systems, transmission and distribution system operation)
- Intralogistics vehicles (industrial trucks like cargo tow tractors, lift trucks, conveyor belts, forklifts, logistics train tows, luggage tow tractors at the airport)

Aside from activities in the area of R&D and market activation, the breakthrough of fuel cell technology through the interlinking of stakeholders for the exchange of experiences will be focused on two innovation clusters. In Clean Intralogistics Net (CIN), 14 companies have joined together in order to advance fuel cell technology, particularly in the intralogistics area. Apart from targeted communication measures (internal and external), aims also include, for example, the dismantling of market barriers as well as national and international cooperation between players. For 21 partners in Clean Power Net (CPN), the secure and environmentally-friendly power supply for industry and business using fuel cells is the centre of interest. Increasingly the solutions are being used for off-grid or uninterruptible power supply, first and foremost in the areas of digital radio for public safety authorities and organisations, telecommunications, traffic management systems, data centres and industrial facilities.

Both networks were initiated and have been coordinated ever since by NOW GmbH. For further information, go to [➤ www.cleanintralogistics.net](http://www.cleanintralogistics.net) and [➤ www.cleanpowernet.de](http://www.cleanpowernet.de)

Digitalisation is based on a functioning telecommunications infrastructure. A reliable emergency power supply using fuel cells and hydrogen ensures operational reliability.



Such a stand-alone emergency power supply system with hydrogen and fuel cells ensures the operation of transmission masts for up to 72 hours.





II. FEDERAL FUNDING CHARGING INFRASTRUCTURE



FEDERAL FUNDING SUPPORT PROGRAMME FOR CHARGING INFRASTRUCTURE FOR ELECTRIC VEHICLES IN GERMANY

A crucial criterion for the further expansion of electric mobility in Germany is a nationwide charging infrastructure with sufficient charging points at the various locations. The desire of customers of not wanting to wait for an available charging point beyond the time required for the actual recharging process must be taken into account. This is especially important in the case of the fast-charging infrastructure, where an appropriate estimate of the number of charging points required must be made. For many people, the purchase of an electric vehicle is only an option if they can charge in an acceptable time-frame, in a user-friendly manner and in close proximity. The establishment of a nationwide, demand-oriented charging infrastructure has therefore played a central role since the Federal Ministry of Transport and Digital Infrastructure (BMVI – Bundesministerium für Verkehr und digitale Infrastruktur) first initiated its electric vehicle activities, culminating in the launch of the BMVI funding programme Charging Infrastructure for Electric Vehicles in Germany (Ladeinfrastruktur für Elektrofahrzeuge in Deutschland) in February 2017.

NOW GmbH has already been addressing this increase in importance since 2016 with the establishment of the Charging Infrastructure division within the Transport area, which received additional staff in 2017 in the run-up to the commencement of the new charging infrastructure funding guideline, and was finally commissioned by the BMVI to establish and operate the German Centre for Charging Infrastructure in January 2020.

Its main tasks involve the coordination and implementation of the BMVI's federal Charging Infrastructure for Electric Vehicles in Germany funding programme, the methodically supported estimation of public charging requirements via the so-called StandortTOOL (LocationTOOL), the coordination of the associated accompanying research, the technical support of the Local Electric Mobility (Elektromobilität vor Ort) funding programme, the preparation of statements and strategy papers, and the close networking and coordination with technical committees and other stakeholders.

The StandortTOOL makes it much easier to expand the charging infrastructure in line with demand, as it provides investors and local authorities with a basis for determining suitable locations. The tool also analyses the status quo, the development of the next few years and the objectives of the German government. Future demand is determined on the basis of traffic flows, socio-economic data as well as user and spatial structures. In September 2019, the StandortTOOL website, www.standorttool.de, was launched. The website provides an overview of the current status of the expansion of the charging infrastructure in Germany. Forecast scenarios for the necessary expansion of the charging infrastructure, which take into account the expected market ramp-up of electric mobility, can also be displayed for 2022 and 2030. The StandortTOOL provides access for the federal states of Germany to enable them to integrate their activities in the field of charging infrastructure with the federal strategy. In future, the StandortTOOL will also cover other alternative infrastructures with refuelling facilities for H₂, LNG and CNG.

In addition, the BMVI's funding programmes in the area of charging infrastructure are actively promoted at external events, such as the nationwide information campaign for the 4th funding call or at the eMove event in Munich in October 2019.



Presentation of the StandortTOOL at eMove Munich

**Info campaign
4th funding call**



No.	City	Event
1	Bad Salzungen	Funding opportunities for electric mobility and charging infrastructure
2	Dresden	Information and networking meeting on the expansion of charging infrastructure in Saxony
3	Oschersleben	ENERGIEFORUM 'Environmentally friendly while on the move – sustainable mobility for work trips'
4	Stralsund	Information event: 4 th call for proposals for charging infrastructure & charging infrastructure concepts Mecklenburg-Western Pomerania
5	Warstein	2 nd day of electric mobility in southern Westphalia
6	Berlin	Electric mobility for companies – subsidised charging infrastructure
7	Neustadt an der Weinstraße	Funding support for public charging infrastructure for electric vehicles – Neustadt
8	Koblenz	Funding support for public charging infrastructure for electric vehicles – Koblenz
9	Emden	Regional charging infrastructure for electric vehicles conference
10	Saarlouis	Towards a climate-conscious future
11	Fulda	Funding support for charging infrastructure for electric vehicles
12	Traunstein	Electric mobility – status quo of funding opportunities
13	Jena	Network meeting charging infrastructure

With the Charging Infrastructure funding support programme, the federal government intends to initiate the establishment of a nationwide network of fast and normal charging stations, in accordance with demand. The aim is to set up at least 15,000 charging stations by 2020, for which the federal government has allocated 300 million euros between 2017 and 2020. Both private investors and cities and municipalities will be supported. As part of the funding programme, the establishment of publicly accessible charging infrastructure will be supported by means of pro-rata financing of the investment costs. In addition, new financing instruments are currently being developed to ensure rapid, reliable and user-friendly expansion.

More than 4,000 applications for funding were received in the first three funding calls. The 3rd funding call is still in the approval process. So far (as of December 2019), applications for a total of 18,300 charging points have already been approved, including around 3,834 fast-charging points. This corresponds to a funding volume of around 117 million euros. A total of 7,958 of the funded charging points are already in operation.

In the 1st funding call, funds were allocated on a first come, first served basis. A total of 1,316 applications for funding support were received. Applications were submitted by municipalities, municipal companies as well as private companies and are evenly distributed across the regions of Germany.

1st funding call:

	 NCP ≤ 22 kW FCP > 22 kW		
	NCP	FCP	In operation
Baden-Württemberg	788	308	851
Bavaria	943	316	963
Berlin	—	13	10
Brandenburg	80	41	96
Bremen	62	32	82
Hamburg	534	47	511
Hesse	262	69	278
Lower Saxony	506	95	620
Mecklenburg-Western Pomerania	32	10	30
North Rhine-Westphalia	1,344	182	772
Rhineland-Palatinate	415	121	434
Saarland	2	8	13
Saxony	137	45	199
Saxony-Anhalt	15	41	27
Schleswig-Holstein	243	22	228
Thuringia	157	42	193
Total	5,520	1,392	5,307

NCP = Normal Charging Point, **FCP** = Fast Charging Point

The 2nd funding call was even more successful with 1,591 submitted applications. Submissions for the establishment of fast-charging infrastructure with a charging capacity of 150 kW in particular exceeded the available budget by a considerable margin. The applications were assessed on the basis of the principle of cost-effectiveness. They were differentiated according to federal states as well as between fast and normal charging.

2nd funding call:



NCP ≤ 22 kW

FCP = 150 kW

	NCP	FCP	In operation
Baden-Württemberg	1,409	143	715
Bavaria	840	168	261
Berlin	36	17	26
Brandenburg	152	23	94
Bremen	3	6	2
Hamburg	2	14	4
Hesse	225	56	112
Lower Saxony	742	39	294
Mecklenburg-Western Pomerania	77	18	1
North Rhine-Westphalia	666	130	411
Rhineland-Palatinate	284	47	133
Saarland	84	18	68
Saxony	352	39	124
Saxony-Anhalt	141	25	55
Schleswig-Holstein	390	10	142
Thuringia	98	2	72
Total	5,501	755	2,514

NCP = Normal Charging Point, **FCP** = Fast Charging Point

The publication of the 3rd funding call followed on 19 November, 2018. Applications for funding for publicly accessible charging stations could once again be submitted from 22 November 2018 to 21 February 2019. With the third funding call of the federal Charging Infrastructure programme, the BMVI is supporting the establishment of up to 10,000 normal and 3,000 fast-charging points. The StandortTOOL was used for the first time in this funding call. The regional distribution of the charging points to be supported is based on the forecast of requirements made by the StandortTOOL. Two maps show Germany in 283 tiles of 40 x 40 km each, which have a maximum quota of charging points to be applied for. One of the maps represents the fast-charging infrastructure and is divided into blue and yellow areas. The blue area shows a higher demand, the yellow area a lower demand. The areas are correspondingly filled with different funding ratios.

3rd funding call:

	 NCP ≤ 22 kW FCP ≥ 150 kW		NCP	FCP	In operation
	Baden-Württemberg	1,060	349	28	
Bavaria	637	443	22		
Berlin	43	15	—		
Brandenburg	27	71	—		
Bremen	18	16	—		
Hamburg	14	19	—		
Hesse	175	123	—		
Lower Saxony	284	157	43		
Mecklenburg-Western Pomerania	20	10	—		
North Rhine-Westphalia	550	162	—		
Rhineland-Palatinate	180	108	7		
Saarland	85	13	10		
Saxony	103	55	6		
Saxony-Anhalt	35	22	4		
Schleswig-Holstein	135	51	17		
Thuringia	79	73	—		
Total	3,445	1,687	137		

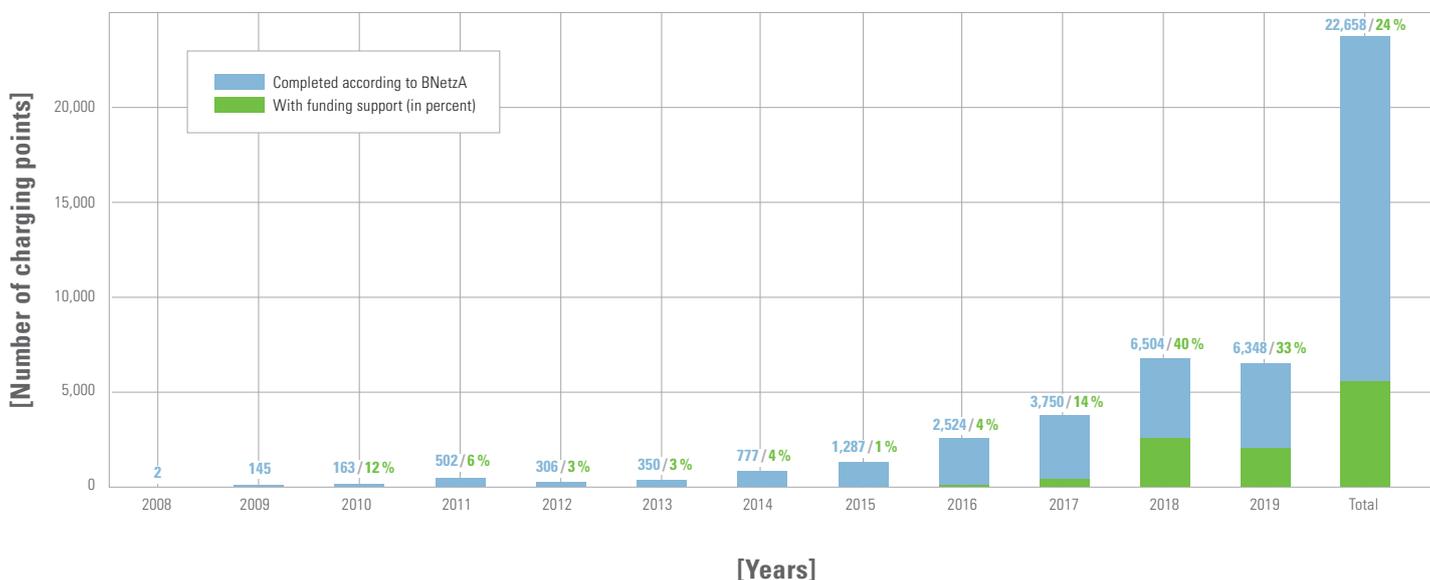
NCP = Normal Charging Point, **FCP** = Fast Charging Point

The 4th funding round commenced on 19 August 2019. The StandortTOOL was used on this occasion again. Special attention was this time given to tourist areas. Up to 1,174 applications with around 5,000 fast and 3,000 normal charging points were received. The charging points to be supported are distributed regionally. Two maps were prepared for this purpose, one for normal charging infrastructure one for fast-charging infrastructure. In both maps the country was divided into 283 tiles with a size of 40 x 40 km each.

The following figure shows the total share of charging points approved by the funding programme among the publicly accessible charging points reported to the Federal Network Agency (Bundesnetzagentur).



Share of total number of charging points funded by the federal funding programme



Data basis: Overall number of charging points put into operation according to the Federal Network Agency (BNetzA – Bundesnetzagentur) Charging Point Register as of 14.01.2020; charging points funded by the Federal Support Programme as of 20.01.2020 according to OBELIS



STANDORTTOOL



Objective

Achieving the climate protection goals in the transport sector will largely depend on the ramp-up of electric mobility by 2030. To achieve this, sufficient charging infrastructure must be available to the user at all times. The StandortTOOL location tool is being deployed to plan and calculate the necessary expansion of the nationwide charging infrastructure by 2030. These calculations form the basis for the policy measures to expand the charging infrastructure.

Moreover, the StandortTOOL estimates the need for expansion of the filling station infrastructure for H₂, LNG and CNG. While the StandortTOOL focuses on passenger car traffic, it can also address the commercial vehicle sector and identify synergies between the various applications.



Need

The development of charging infrastructure is not economically viable at many locations. This is why in many cases sites that are necessary for the mobility needs of users are not built or equipped with sufficient charging points. The StandortTOOL analyses the charging infrastructure requirements from the user's point of view and takes the further expansion needs up to 2030 into account. Only if sufficient charging infrastructure is available at the right locations from the user's point of view will electric mobility take hold. Compared to the existing conventional filling station infrastructure, the charging network must be much tighter due to the smaller ranges. With the other alternative fuels, a stronger orientation towards existing filling station locations is possible.



Methodology

The modelling methodology compiles various indicators such as traffic flows, vehicle distribution, the existing charging infrastructure and regional structures (urban or rural areas) and calculates the charging sessions that are anticipated per spatial unit (e.g. tile). The special feature is that all charging processes of supported charging stations are integrated into subsequent expansion planning. The development is conducted by the IVV Aachen engineering group, the ISB chair of RWTH Aachen University, DLR and RLI.



Leaflet | © Geobasis-DE/BKG | Ingenieurgruppe IVV with calculations IBB, DLR, RLI | Version 1.0 | License information

Additional charging requirements 2030



With the StandortTOOL location tool, NOW GmbH supports the planning of charging infrastructure.
➤ www.standorttool.de

III. FEDERAL FUNDING LOCAL ELECTRIC MOBILITY



LOCAL ELECTRIC MOBILITY

Structure and climate policy backdrop of the programme

Against the backdrop of existing climate policy requirements, the German federal government set itself concrete targets as early as 2009 in its National Electric Mobility Development Plan (Nationale Entwicklungsplan Elektromobilität) for the market development of electric mobility in Germany for the years 2020 and 2030. Electric mobility based on batteries and fuel cells can make a decisive contribution to achieving the climate targets for transport and, against the background of the increasing share of renewable energy in the German electricity mix, is an important component of the energy transition. In addition to the growth targets for vehicles (for the above-mentioned reference years), the development of Germany as a 'lead market for electric mobility' is a central issue. To this end, for more than ten years the German government has been supporting the market preparation and the market ramp-up to initiate a mass market by means of targeted support programmes for electric mobility with batteries and fuel cells.

Together with the implementation of existing funding guidelines, the BMVI shapes the political framework, ensures that the programme is firmly anchored in the political landscape and is responsible for setting the main focus in the field of electric mobility. NOW GmbH coordinates and manages the 'Local Electric Mobility' (Elektromobilität vor Ort) funding programme on behalf of the BMVI. The primary tasks include the implementation and strategic development of the programme, the definition and selection of the programmatic priorities in consultation with the BMVI and in cooperation with the project management organisation, the coordination of the accompanying scientific research and the steering of the individual projects.

The project management organisation (Jülich [PtJ]) is responsible for the administration of the programme and the projects, and oversees the programme in terms of funding regulations. In regard to investment support for vehicles and charging infrastructure, the project management organisation takes on a special role due to the scope of the applications. Coordination on a regional level is provided by the regional networks (project management offices), which are staffed with regional players from the fields of economic development, municipal utilities, state agencies and energy agencies for electric mobility as well as other public-private partnerships. They facilitate an exchange between the local project partners and thus ensure local and regional participation in the federal programme.

Among the places where regular cross-regional exchange occurs is the BMVI Strategy Circle. It is the platform on which representatives of regional networks, participants in accompanying research as well as the BMVI, NOW GmbH and PtJ discuss the programme activities.



Clean Air Immediate Action Programme

The promotion of electric mobility is becoming even more important as a result of the discussion on driving bans in German city centres and the pollution caused by nitrogen oxides, noise and particulate matter, which has been attracting greater attention since 2017. A large number of cities exceed the EU limit values for nitrogen dioxide, in some cases considerably. In this context, the Commission filed a complaint against Germany and five other member states with the European Court of Justice in 2018. By initiating the 'Clean Air 2017 to 2020' Immediate Action Programme ('Sofortprogramm Saubere Luft 2017 bis 2020') at the end of 2017 to improve air quality in German city centres, the German government is responding to this situation. The promotion of electric mobility plays a central role in this. The 750 million euros in emergency aid originally announced by the federal government in 2017, plus 250 million euros from the automotive industry (including a total of 350 million euros for the electrification of transport), was increased by 500 million euros at the end of 2018 in the context of a further municipal summit. Four active programmes from three federal ministries (BMVI, BMU, BMWi) are addressing electric mobility with an additional 350 million euros. In the context of this immediate action programme, the existing 'BMVI Electric Mobility Funding Guideline' (Update 2017) proved to be a valuable and comprehensive set of measures. This enabled the BMVI to react promptly and fully implement a call for funding for NO_x-affected municipalities in 2018 and 2019.



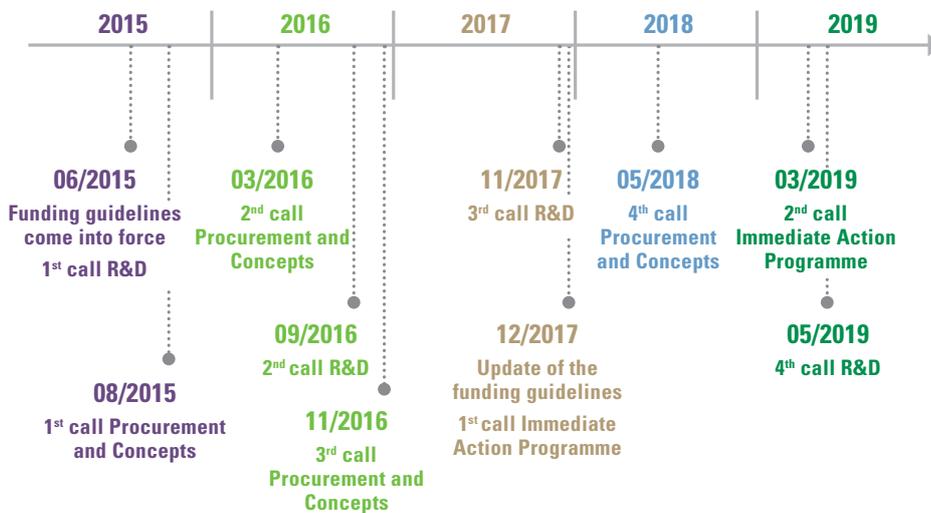
Funding Priorities: Procurement, Concepts, Research & Development

The Electric Mobility Funding Guideline, which has been in effect since 2015, also forms the basis for the BMVI's other electric vehicle-related funding activities (focus on battery electric mobility). It is the basis for the ongoing continuation of the funding programme until the end of 2020, with which the BMVI supports the procurement of electric vehicles (through so-called investment support), especially in municipal fleets as well as in commercial fleets integrated in municipal services. At the same time, the necessary charging infrastructure is also being supported. Municipalities can also develop electric mobility concepts (so-called environmental studies) with the aim of raising awareness of the topic of electric mobility or integrating it more strongly into the municipal domain. In addition to investment and concept funding, research and development projects are funded as a third instrument. While the investment projects focus on the market ramp-up and the concepts support regional/municipal market preparation, the research and development projects, together with the programme-related accompanying research, make a significant contribution to the acquisition of knowledge at the level of the overall programme. They serve to set priorities in the R&D funding itself, the detailed orientation of the investment projects and

the strategic further development of the funding programme. Calls for funding submissions in the three funding areas are published annually on the basis of the funding guidelines. They allow adjustments to be made to market requirements and offer the necessary scope and flexibility to provide the best possible support for market ramp-up.

 **Programme Status**

Since the guideline came into force in June 2015, four calls have been made for each of the individual funding pillars (R&D, Procurement and Concepts). At the end of 2017, the funding guideline was amended slightly to better reflect the requirements of the Clean Air Immediate Action Programme. In this regard, the guideline was extended until the end of 2020. Besides the standard programme, two separate funding calls were conducted in 2017 and 2018 as part of the Clean Air Immediate Action Programme on the basis of the funding guideline.



Across all funding priority areas, approximately 930 projects have been funded to date. As a result, the total vehicle and infrastructure potential amounts to 16,102 vehicles and 8,330 infrastructure units. These measures are supported by the BMVI with funds of approx. 359 million euros.

The current overall picture regarding the funding support for electric mobility at the end of 2019 is as follows:

Funding priority	Number of projects	Number of vehicles, charging infrastructure	Funding
Research & Development	27 approved & 8 in application process	Targets: 1,170 e-vehicles 629 charging units	€ 62.5 million
Electric vehicles and charging infrastructure (Procurement/Investment)	389 approved applications	Targets: 5,905 e-vehicles 2,589 charging units	€ 68.9 million
Electric vehicles and charging infrastructure (Procurement/Investment on the Clean Air Immediate Action Programme)	300 approved applications	Targets: 9,027 e-vehicles 5,119 charging units	€ 214 million
Municipal electric mobility concepts	212	No direct implementation	€ 12 million



Procurement Funding Support

Procurement Funding Support in the 'Local Electric Mobility' funding guideline

The Electric Mobility Funding Guideline places particular emphasis on municipal and commercial vehicle fleets. For operators, the use of electric vehicles is advantageous from several angles. By successively integrating electric vehicles into their fleets, it is possible to sustainably reduce greenhouse gas and pollutant emissions (CO₂, NO_x). Since the daily operational profile of many journeys is predefined, electric vehicles can also be specifically scheduled wherever distances can be calculated or intermediate charging is possible. In addition, municipal vehicle fleets in particular are generally very well suited for conversion to electric vehicles due to the short distances generally involved.

Municipalities and municipal companies are eligible to apply for funding. Commercial companies that are part of a municipal electric mobility concept can also apply.

Both the electric vehicles themselves and the charging infrastructure necessary for their operation are eligible for funding support. In the case of vehicles, the additional costs compared to conventionally operated vehicles and, in the case of the charging infrastructure, the total costs can be subsidised proportionately. The subsidy rates are between 40 percent for companies and up to 90 percent for municipalities.

Electric Mobility Funding Guideline 2015 – 2019	Approved					
	Passenger vehicles	Commercial vehicles (<3,5 t)	Trucks (> 3,5 t)	Buses	Special vehicles	Charging infrastructure
Baden-Württemberg	1,717	450	13	37	36	1,059
Bavaria	1,039	632	6	58	9	739
Berlin	144	361	20	106	138	487
Brandenburg	58	20		2	10	51
Bremen	2	3	1	5		8
Hamburg	431	278		126	12	815
Hesse	739	385	6	2	48	676
Lower Saxony	2,205	644	2	1	30	856
Mecklenburg-Western Pomerania	13	6			5	13
North Rhine-Westphalia	3,005	2,354	3	11	140	3,112
Rhineland-Palatinate	187	106		8	22	234
Saarland	4	4				5
Saxony	168	58			7	135
Saxony-Anhalt	35	28				29
Schleswig-Holstein	61	33		35	17	118
Thuringia		16				
Total	9,808	5,378	51	391	474	8,337

Funding in 2019

In 2019, a second call was made under the Clean Air Immediate Action Programme. A total of 165 applications were received with a requested funding volume of more than 265 million euros. This represents another sharp increase in demand for funding compared with 2018.

Due to limited funding, however, only 88 applications with a volume of approximately 65 euros million could be funded under the call. These encompass 405 passenger cars, 610 commercial vehicles (< 3.5 t), 18 commercial vehicles (> 3.5 t), 97 special-purpose vehicles and 29 buses. In addition, 654 associated charging points were approved.

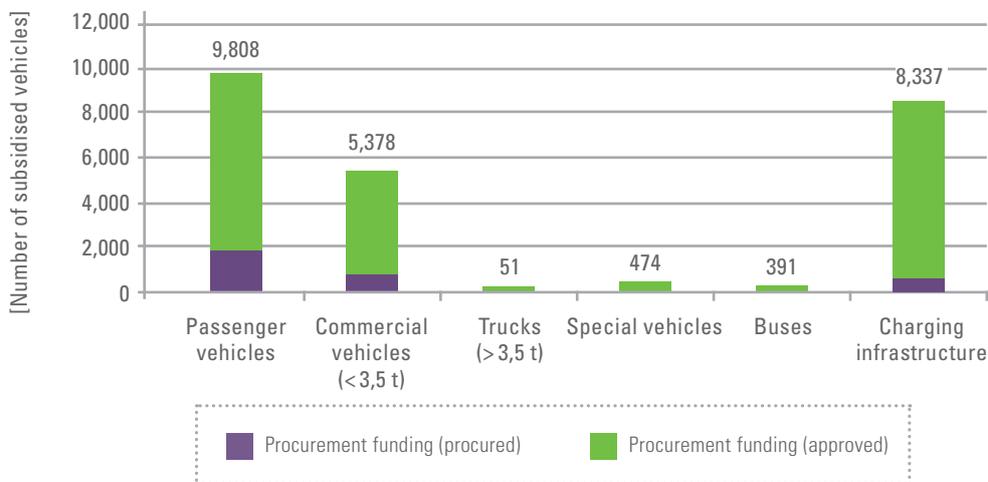
Procurement Funding Support – Overview of all procurement projects under the guideline

Following the four funding calls under the standard programme and two additional calls under the Clean Air Immediate Action Programme for the years 2015 to 2019, a total of 699 procurement projects with a funding volume of 300 million euros were approved. These include a total of over 9,800 passenger cars, almost 5,400 commercial vehicles, 400 buses and over 8,300 charging points. The fleet sizes within the funding applications vary from around 1,500 commercial vehicles at Deutsche Post to a single vehicle in a municipality.

The table below depicts all subsidised vehicles according to federal states. North Rhine-Westphalia, Berlin and Baden-Württemberg are particularly active in the implementation. The difference between the vehicles approved (left) and those already procured (right) and thus in operation is striking. This gap is particularly noticeable in the tendering processes of municipalities and municipal companies, as well as the partly long delivery times for vehicles and the still limited choice of vehicles available. In view of an increasing vehicle range and the general progress of the support programme, this gap will gradually close in 2020.

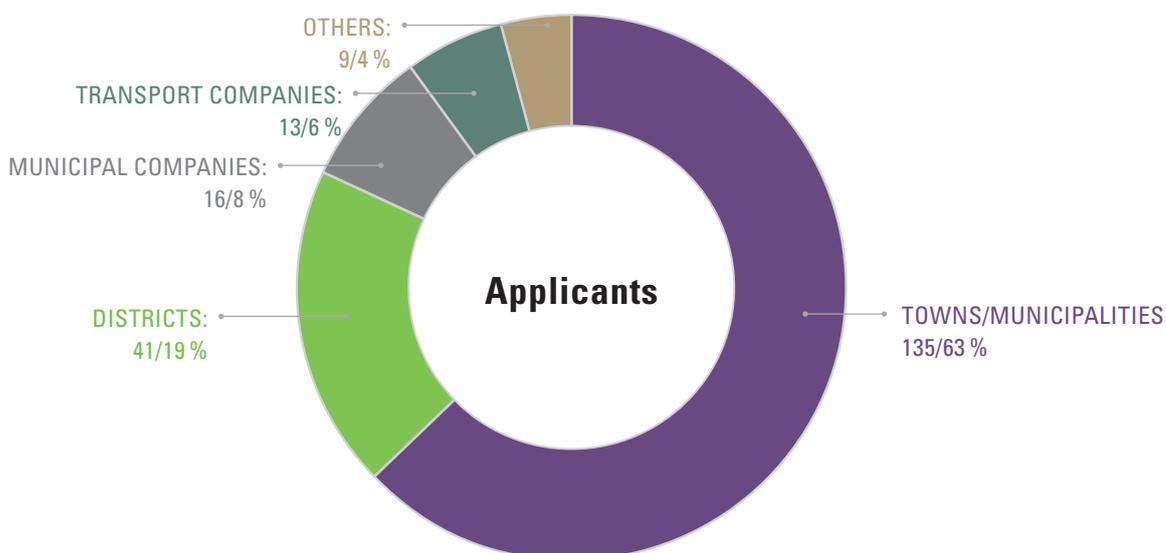
Procured						Funding [€]
Passenger vehicles	Commercial vehicles (< 3,5 t)	Trucks (> 3,5 t)	Buses	Special vehicles	Charging infrastructure	
174	110	3	10	6	129	42,748,581
541	91		4	2	57	28,413,166
44	8				19	47,339,360
16					2	2,789,431
1	1					1,146,466
16	17		10		3	38,852,930
69	36			5	55	20,853,374
290	53		1	14	59	22,371,724
3	3			1	4	475,180
649	415		1	23	274	67,043,606
24	15			3	13	8,745,775
						72,797
79	13				13	3,595,021
12					5	410,062
13	2			3	15	15,762,183
	16					152,117
1,931	780	3	26	57	648	300,771,773

Procurement funding
(cumulative target figures until 31.12.2019)



Concept Funding Support

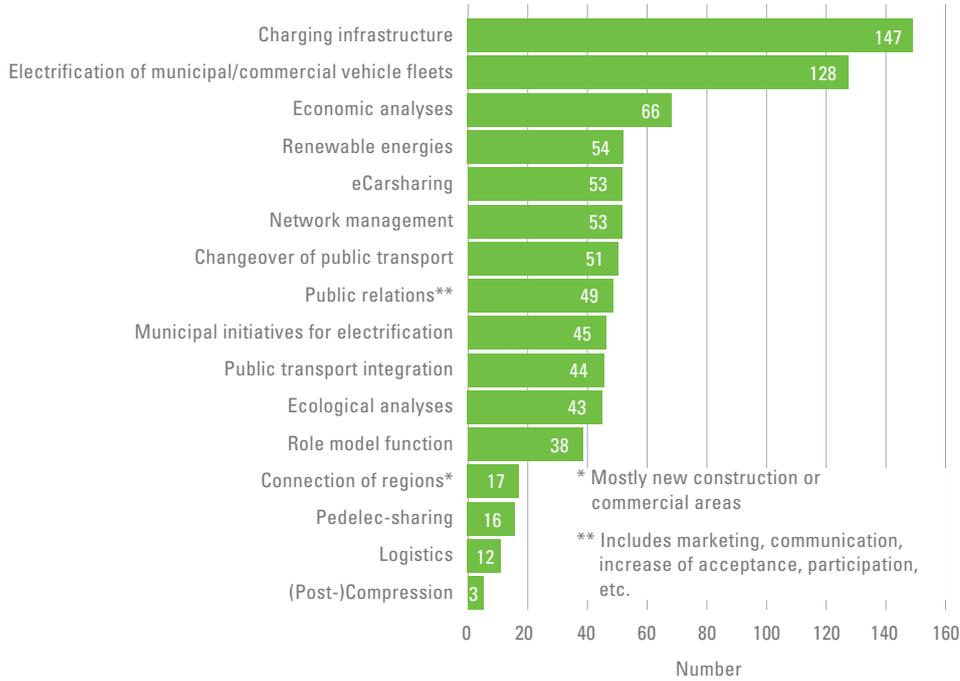
Demand for this funding priority remains at a consistently high level. Following four calls for funding, more than 210 municipal electric mobility concepts are now funded by the BMVI. Of these, approx. 60 concepts have already been completed (➔ **Table 1st – 4th Call Standard Programme**). 63 per cent of the applicants are cities and municipalities, 19 per cent districts, 8 per cent municipal companies in the energy sector, 6 per cent municipal transport companies and 4 per cent other entities such as non-profit associations and specialised bodies.



An overview of all electric mobility concepts can be found on the StarterSet Electric Mobility ➔ www.starterset-elektromobilitaet.de/praxis/elektromobilitaets-konzepte website via the “Praxis” tab (in German). After successful completion of the concept, the final reports are made available for download on this website.

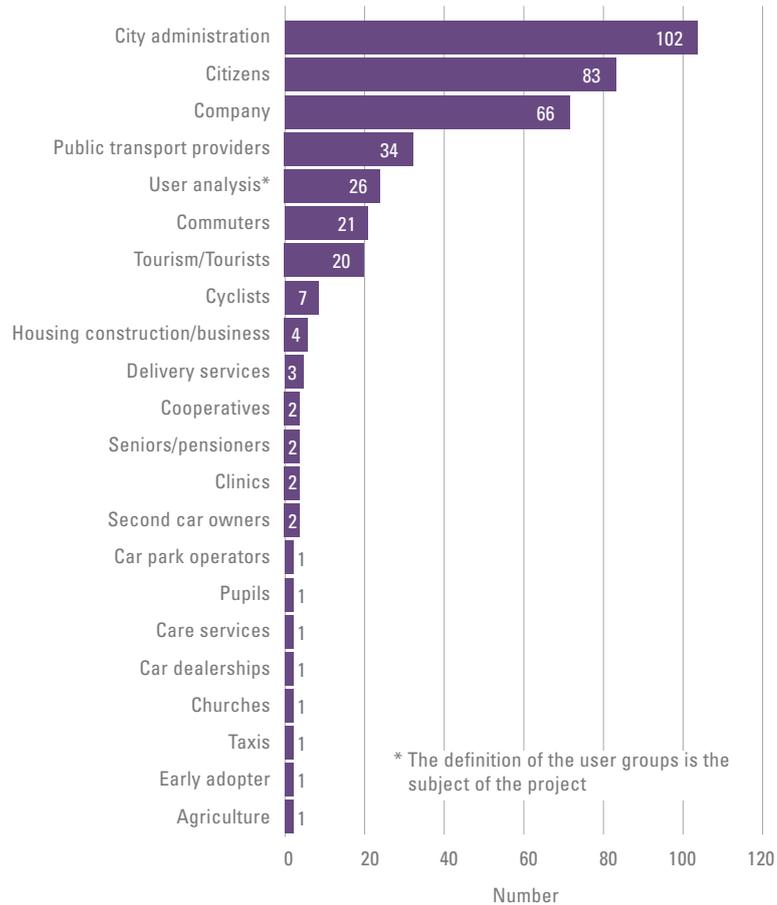
The contents of the electric mobility concepts are diverse and varied. They range from general concepts for analysing the potential of electric mobility in the municipality to very specific topics such as the development of an exclusive e-taxi fast charging infrastructure. The largest share is taken up by concepts in the fields of activity involving the electrification of municipal or commercial vehicle fleets and charging infrastructure issues (see chart: Fields of Activity). In combination with the electrification of vehicle fleets, the establishment of e-car sharing at the municipal level is often also sought, sometimes in combination with other sharing services such as pedelec (e-bike) sharing. Increasingly, concepts also focus on the electrification of public transport and its integration and connection with newly created services in order to electrify intermodal transport chains.

Overview of fields of activity in the electric mobility concepts



Following the fourth call for funding for electric mobility concepts, almost 90 concepts were newly approved in 2019. The main areas of activity in fleet management and the establishment of a public charging infrastructure remain the focus of concept funding. In comparison to previous calls, the newly approved concepts now increasingly address topics such as network management in the sense of bringing together the various stakeholders, public transport conversion and the integration of renewable energies.

Target groups of the measures addressed in the electric mobility concepts



Also of interest are the target groups (see Target Groups chart) that are addressed in the concepts. Besides the city administration, which is the main target group, individual parties within the municipality are also addressed. Apart from target groups such as companies, public transport providers, commuters and tourists, the focus is also on citizens. The newly approved concepts now also address car park operators, schools and care services.

1 st –4 th Call Standard Programme (01.07.2015–31.12.2019)	Approved		Completed	
	Funding amount	Number of projects	Funding amount	Number of projects
Baden-Württemberg	2,623,894	44	722,188	12
Bavaria	2,085,322	38	522,332	9
Berlin	48,600	1	—	—
Brandenburg	293,921	6	99,703	2
Bremen				
Hamburg	302,326	4	79,686	1
Hesse	811,957	15	178,442	3
Lower Saxony	1,112,660	19	343,695	7
Mecklenburg-Western Pomerania	111,492	2	—	—
North Rhine-Westphalia	1,657,495	27	241,324	5
Rhineland-Palatinate	779,224	15	250,806	5
Saarland	300,818	5	73,377	1
Saxony	674,238	14	224,727	5
Saxony-Anhalt	348,999	7	62,713	2
Schleswig-Holstein	227,541	8	34,659	2
Turingia	260,059	7	102,311	3
Total	€ 11,638,545	212	2,935,962	57

 **R&D Funding Support**

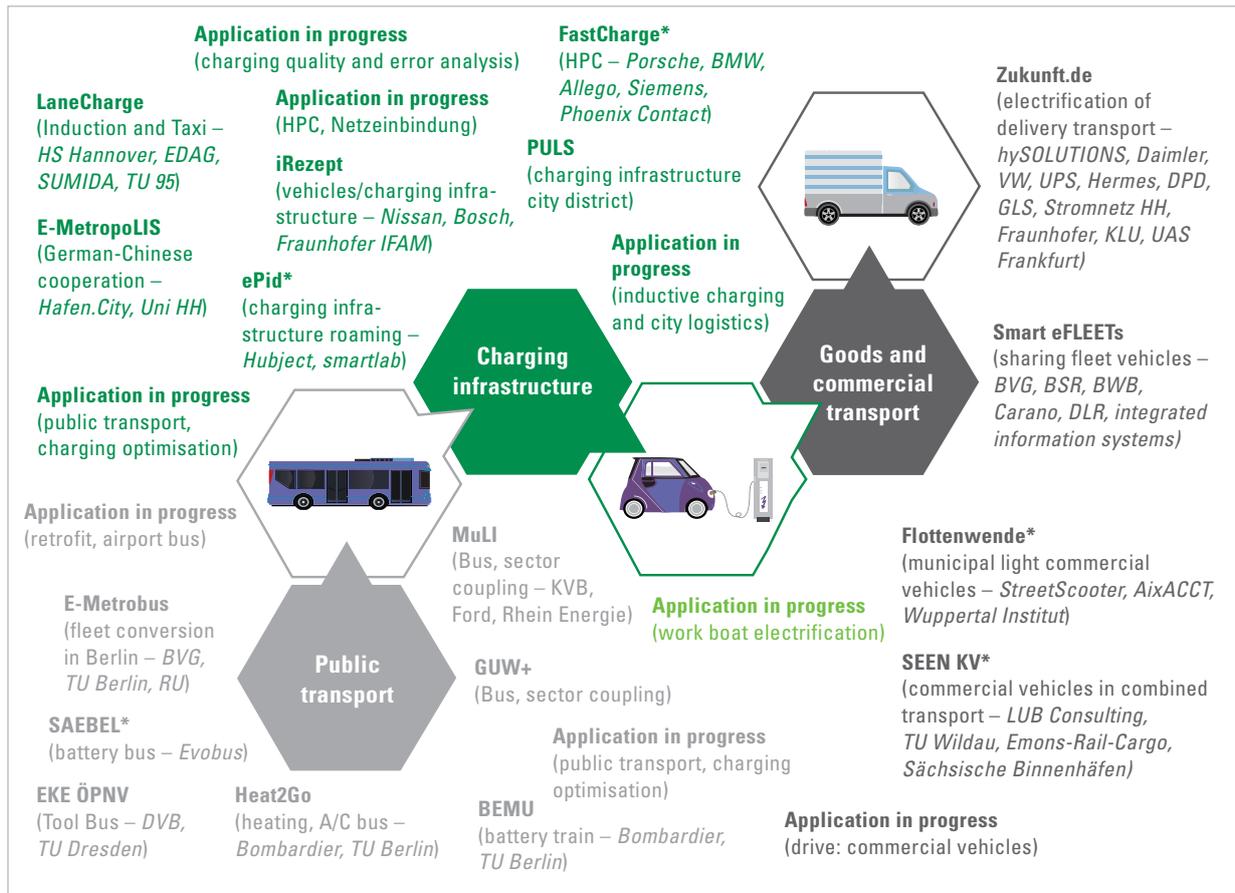
The Electric Mobility Funding Guideline also includes the strategically important funding instrument of classical research and development (R&D) to further support market ramp-up. In addition to making a pivotal contribution to the market ramp-up of electric mobility, the supported R&D projects also provide important new insights for the thematic fields of the programme's accompanying research.

Since the funding guideline came into force in 2015, four calls for funding have been conducted in the R&D area. These calls focus on practical technology testing and further development (Chart 1). The 4th call for research projects took place between May and August 2019. With the aim of providing targeted market support, it was possible to further focus the research topics and adjust the priorities within this call. This focus applies in particular to the area of classical technological research and development. Here, the focus is on those areas of application in which market penetration is still inadequate and in which vehicle availability is reduced (including freight and commercial transport). With the goal of linking existing or soon-to-be-introduced vehicle fleets and infrastructure units, the new focus of the large-scale demonstration projects was established. In the future, the relevant stakeholders will be brought together and research questions will be answered from within the overall system. This systemic approach follows the recommendations of the National Platform Electric Mobility (NPE) and National Platform Mobility (NPM).

1 st call (07/2015)	2 nd call (09/2016)	3 rd call (11/2017)	4 th call (05/2019)
<ul style="list-style-type: none"> • Innovative charging technologies • Networking of vehicle and charging infrastructure • Electrification of public transport, goods and special transport, maritime applications • Usage and drive concepts • Battery and battery components • System solutions and services 	<ul style="list-style-type: none"> • Innovative charging technologies • Networking of vehicle and charging infrastructure • Electrification of local public transport, freight and commercial transport • Special transport, maritime applications • Integration of renewable energies 	<ul style="list-style-type: none"> • Innovative charging technologies • Electrification in public transport (road and rail) • Electrification of freight and commercial transport (road and rail) • Special transport and maritime applications • Project support of the existing German-Chinese cooperation of the BMVI 	<ul style="list-style-type: none"> • Technology research in sectors with low vehicle availability, including freight/commercial transport, buses, ships and special transport • Innovative charging technologies • Component/system development and integration into the overall system • Application-oriented battery development (no basic research) • Battery changing systems, battery integration • Large-scale demonstration projects with existing vehicle fleets

Accompanying research to secure results

Focus of the R&D funding calls



* Completed projects

Thematic distribution of completed, applied for and ongoing R&D projects

Currently, 12 R&D projects from the 1st, 2nd and 3rd call are in progress. Nine other projects are still in the application process. Approval is expected in 2020. Five projects have already been completed. The main focus is on public transport, charging infrastructure and freight and commercial transport.

This is supplemented by projects involving cooperation between national or regional research funding institutions within the framework of ERA-NET Plus to pool Europe’s scientific expertise. Here there are currently 10 ongoing projects.

Completed projects 2019

- Heat2Go
- FastCharge
- ePid
- Flottenwende

Commenced projects 2019

- E-MetroLIS
- LaneCharge
- Smart eFleets
- GUV+







ELECTRIC MOBILITY IN PRACTICE

Since 2015, real driving and charging data of electric vehicles have been collected and evaluated by the Central Data Monitoring (ZDM – Zentrale Datenmonitoring) within the scope of the BMVI's electric mobility support programme. Between 2015 and 2016, a total of 900,000 trips and 180,000 charging procedures were recorded for 945 electric vehicles in the context of the model regions and the so-called electric mobility showcases. In addition, data from approx. 280,000 trips and approx. 42,000 charging procedures were collected in 2018 and 2019. For this purpose, the ZDM has installed electronic data loggers in 219 funded e-vehicles that are used in municipal and commercial fleets on a daily basis. The data is supplemented by a biannual master data query for all procurement projects.

The practical data collected within the scope of the funding programme provides the opportunity to gain a well-founded insight into the real use and suitability for everyday use of electric vehicles. Thus, the evaluation of the data loggers installed in the current period once again shows that purely electric vehicles are well suited for use as pool vehicles in municipal and commercial fleets (including services in the courier and parcel delivery sector). In the above-mentioned contexts, the vehicles are driven an average of 40 km or less daily and cover significantly less than 10,000 km per year. These daily and annual mileages can be well represented by current ranges of the battery electric vehicles used. In almost all cases, this implies that less than a quarter of the actually possible range of the electric vehicle is used per day. This applies to all vehicle segments considered (mini, small, compact and light commercial vehicles) and to various battery capacities from 20 to over 40 kWh. The results of the real data evaluation in the programme indicate that from an economic and ecological perspective it makes sense to make a targeted selection of the vehicle for the respective usage context (including vehicle type and size, battery size) and to ensure good levels of vehicle utilisation, e.g. via sharing approaches. Especially the battery size (battery capacity), as a range-determining factor, should correspond to the context of use.

Valuable insights can also be gained from the evaluation of practical experience with regard to the charging behaviour in the fleet applications of the support programme. In the current survey period, the charging frequency per day for pure electric fleet vehicles has slightly decreased in contrast to the years 2015/2016. For commercial fleets, the charging frequency per day has fallen from 1.6 to 1.3 and for municipal fleets from 1.5 to 1.4 charging procedures. This indicates greater confidence in the new technology and a more casual approach to it. Also noteworthy is the fact that 90 percent of the charging procedures at charging points take place at the vehicle base, mostly at the depot. Public charging points are used for only 10 per cent of the charging procedures in the electric vehicles recorded by the ZDM. The charging behaviour is therefore also strongly influenced by the context in which the electric vehicles are used.

Further relevant results of the evaluation of real driving and charging data will be published in a ZDM publication at the beginning of 2020.



“Charging point only for electric vehicles”

IV. MOBILITY AND FUELS STRATEGY



THE MFS AS A CENTRAL PLATFORM FOR SHAPING THE ENERGY TRANSITION IN TRANSPORT

In 2019, public discourse on alternative drives and fuels was shaped by climate cabinet decisions as well as the adoption of the climate package and climate protection law by the federal government. A variety of measures to support the market ramp-up of electric mobility using batteries and fuel cells as well as alternative fuels were discussed. Building on the already existing regulatory framework conditions and funding support, political decisions once again substantially raised ambition levels in all sectors. The discussion on the most useful, convenient and/or most efficient solutions for climate protection in the transport sector continues to play a special role in this regard.

NOW GmbH has tracked this discussion in terms of content and provided technical advice to the BMVI using the findings gained from ongoing funding programmes and continuously monitoring political developments in Germany, Europe and globally, along with activities in both the research area and industry.

NOW GmbH is tasked with supporting the BMVI in implementing the Mobility and Fuels Strategy (MFS; in German: *Mobilitäts- und Kraftstoffstrategie – MKS*), an overarching framework adopted in 2013. Its objective is to facilitate expert consultation in the area of alternative drives and fuels as well as monitor specific support measures. The scientific and technical evaluation of pilot projects, the (further) development of funding measures and the monitoring of implementation is at the forefront here.

The following statements make it apparent that in the continuation of the MFS, various investment and pilot projects across all markets and technologies will be implemented for the transport sector and coordinated by NOW GmbH. For environmentally-friendly on-board and mobile shoreside power supply for seagoing and inland waterway vessels, NOW GmbH developed a funding concept in 2019. The funding guideline on which it is based will be published in 2020. The second funding call in the area of LNG equipping and retrofitting of maritime vessels heralds the establishment of a range of market-driven supporting measures. A particular focus of MFS further development is the measures contained in the Climate Protection Programme 2030 in the following areas of activity: 'Alternative fuels', 'Freight transport' and 'Commercial vehicles'. NOW GmbH also supports the BMVI for these new measures in the formulation and implementation of market incentive programmes.

Market observation and technology monitoring are also key tasks of NOW GmbH, especially for the market ramp-up of vehicles with alternative drives, analyses on sustainable mobility solutions, energy system analyses as well as technical ways to manufacture electricity-based and biogenic fuels. Here in particular it is the job of NOW GmbH to evaluate technological approaches and their relevance for achieving climate protection goals in the transport sector.

Aside from assessments about technology development, market ramp-up and cost outlooks to be applied in the transport sector, looking beyond application areas and across sectors has always played an important role. This was one of the topics of the BMVI study: 'Regulatory frameworks for an integrated 2050 energy concept and the incorporation of RE fuels', which examined the development of technology paths in the transport sector in a cross-sector model of the entire energy system.

As part of NOW's remit, European and international developments are also taken into account in the formulation of strategy. Because the aviation and maritime sectors involve cross-border transport in particular, it is precisely in these areas that international developments are also especially significant. Furthermore, the regulatory framework for alternative fuels and drives is largely determined by implementation requirements at European level. These include for example the implementation of Directive 2014/94/EU on the Alternative Fuels Infrastructure (AFID) or the revised Renewable Energy Directive (RED II) as well as the respective national implementations.

 **Network**

Because of the comprehensive scope of topics found under the MFS remit, a large number of stakeholders are relevant. Specific themes are discussed with industry and science in various formats.

In addition to NOW GmbH technical expertise, the MFS project office, overseen by IFOK GmbH, also assists the BMVI in involving key specialists in the MFS in the framework of an expert dialogue. The project office also coordinates communication and public relations on the MFS. The BMVI is also supported by scientific monitoring. The scientific consortium conducts evaluations on measures and technologies for the analysis of individual topic areas which could contribute to the reduction of end energy consumption and greenhouse gas emissions.

Practical insights which address research questions are also incorporated via specific expert workshops. In this way relevant developments can be taken into account and the results seamlessly transposed to an implementation phase. A target-oriented exchange is thus facilitated between the relevant stakeholders.

Additionally, the National Platform Future of Mobility (NPM) was established at the end of 2018 as an advisory board for the federal government. In a broad dialogue with stakeholders from science and industry, its purpose is to discuss the entire spectrum of developments in the transport area as well and help shape recommended courses of action for the climate protection policy decisions in transport. NOW GmbH monitors this work on behalf of the BMVI in the appropriate working groups for alternative drives and fuels and brings its expertise to the table in this process.

NOW GmbH also addresses specific topics with its own workshops and deepens the exchange with relevant market players. Most recently one focus area was urban as well as long-haul freight transport. The 'Urban commercial transport' workshop has already been held for the second time, in which specific examples of actions in urban logistics were outlined and the relevant regulatory framework discussed in small groups. The results of the workshop are to be published in 2020 as a brochure.

LATEST DEVELOPMENTS IN ROAD FREIGHT TRANSPORT

In the autumn of 2019, the federal government's Climate Protection Programme 2030 was published. In it goals and actions are formulated for the area of road freight transport. By 2030, around a third of mileage in heavy-duty freight transport by road is to be covered electrically or with electricity-based fuels. The Climate Protection Programme 2030 in turn serves to implement the 2050 climate protection plan. According to the Climate Protection Programme 2030, a 42 per cent reduction of 1990-level greenhouse gas emissions is needed by the year 2030. The goal is an almost complete decarbonisation of the transport sector by the year 2050. Correspondingly, with the further development of the MFS, these objectives strive for the speediest achievement of market maturity for alternative drives and fuels.

Aside from prevention, or the transfer of traffic to rail and inland shipping, the use of alternative drives and fuels in road freight transport is an important measure to contribute to the reduction of CO₂ in the transport sector. Using vehicles with battery-electric or hydrogen fuel cell drives as well as hybrid overhead (HO) trucks in particular are crucial drive and fuel options to boost decarbonisation to a significant degree in the commercial vehicle segment. The use of vehicles with drives based on compressed natural gas (CNG) or liquefied natural gas (LNG) can contribute to achieving this goal over the long term, provided renewable methane is the fuel used.

Compared to conventional types, vehicles with the aforementioned drive and fuel types are often considerably more expensive in terms of purchase and/or operation. That is why the BMVI aims the funding instruments towards reducing additional costs incurred in the purchase and operation of vehicles with alternative drives.

**Funding pilot projects under MFS in the road freight transport sector**

The BMVI funded a pilot project from the **Ludwig Meyer** GmbH & Co. KG company on liquefied natural gas (LNG) in road freight transport. 20 LNG trucks were procured for food logistics in the Berlin area and tested in real operation. The construction of the LNG refuelling station in Grünheide (Mark) was funded under the EU project: Blue Corridor.

“Meyer Logistik is a pioneer in the alternative drive sector in Germany. After the BMVI assumed 40 per cent of the additional costs incurred compared to diesel trucks in the acquisition of our 20 LNG vehicles, we were able to show that after three-and-a-half years in real operation, the technology is worth it – both economically and ecologically. With upwards of 14,000 kilometres per month, the purchase can be amortised in three years, CO₂ savings of up to 20 per cent are made compared to a diesel truck tank-to-wheel, consumption has decreased by 18 per cent and particulate emissions are reduced by 90 per cent. We want to continue to expand our truck fleet with liquid gas for regional and long-distance transport and hope that the parameters for this – refuelling station infrastructure and vehicle costs – improve swiftly.”

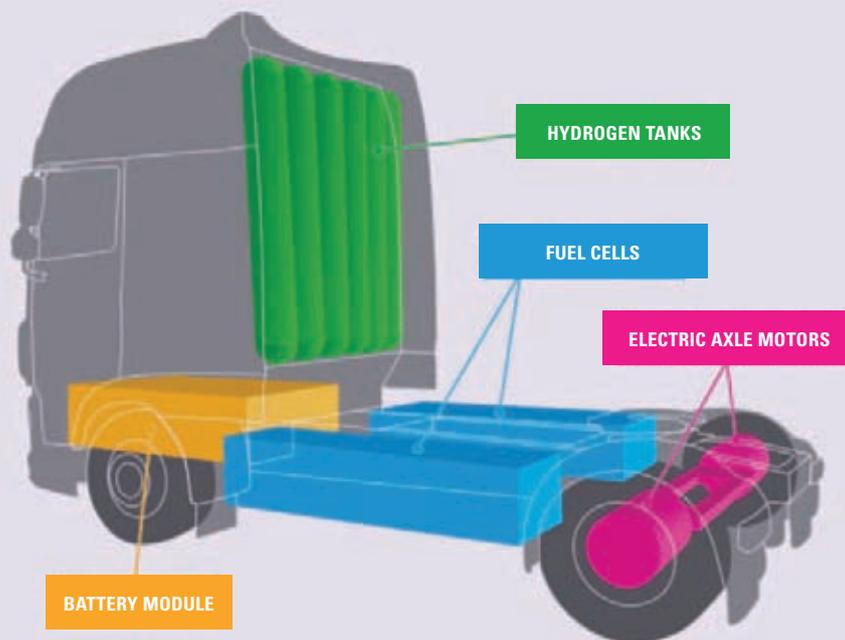
Matthias Strehl, Meyer GmbH & Co. KG

The pilot project ran successfully from 2016–2019 and was monitored scientifically. This scientific monitoring included the technical, ecological and economic evaluation of the fleet’s operation. Over a period of 13 months, 20 LNG trucks were deployed by the freight company and the operational data compared with that of 20 diesel trucks. The drivers’ experience was also surveyed and four reference drives conducted. The operation of the mobile LNG refuelling station specifically made available for the demonstration project was also evaluated. The final report can be found at www.bmvi.de/SharedDocs/DE/Anlage/G/MKS/bericht-einsatz-Ing-demo-lkw.html



In an MFS pilot project, in 2017 the BMVI funded the procurement of CNG trucks with biomethane as a fuel. The picture shows one of the vehicles at the Schkopau container terminal.

In 2017 the BVMI funded the use of four CNG trucks in the **Konrad Zippel Spediteur** GmbH & Co. KG fleet in another MFS pilot project. The vehicles are deployed in combined transport between the container loading terminal in Schkopau near Halle and the BMW plant in Leipzig. Biomethane is used as a fuel. Through the combination of rail freight transport and biomethane as a fuel, the project has demonstrated almost totally CO₂-neutral transport. By the end of 2019 the four vehicles had covered approx. 680,000 kilometres and used approx. 200 t of biomethane produced from biological waste. This corresponds to a CO₂ saving of approx. 600 t over the project's duration to date. Due to these positive experiences, a further eight vehicles have now been procured for the Berlin location.



In October 2019 the BMVI granted subsidy notes for the retrofitting of diesel trucks with hydrogen fuel cell drives. The figure shows the structure of the planned HyBat truck.

The BMVI's pilot funding constitutes a foundation for the economic success of the project, through which the business risk in terms of higher purchasing and maintenance costs and uncertain vehicle residual values can be mitigated.

Apart from natural gas, hydrogen is also being examined under the MFS as an option to reduce greenhouse gas emissions and pollutants in heavy-duty freight transport by road. Therefore, in October 2019, subsidy notes were given to the companies **E-Cap Mobility GmbH** and **Clean Logistics GmbH** for the retrofitting of five diesel trucks. The plan is to swap the conventional drive with an innovative, intelligent and integrated fuel cell drive system, including a battery storage system. With both applicants E-Cap Mobility and Clean Logistics working in close cooperation, the retrofitting of the diesel trucks is currently at the concept development phase. In 2020 the extensive examinations of the performance requirements for the planned retrofitting kit will be completed and an interface control document created to connect the FC and battery components. The first tests on public streets have been announced for the autumn of 2020.



Procurement funding and further BMVI measures for vehicles with alternative drives in road freight transport

Based on experiences from MFS pilot projects among others, the EEN funding guideline was developed. The 'Funding programme for energy-efficient and/or low- CO₂ heavy commercial vehicles in road freight transport companies' came into force in June 2018. The funding programme will fund the purchase of natural gas (CNG and LNG) as well as electric drive (battery and hydrogen fuel cell) vehicles which are subject to tolls with a

permissible gross weight of over 7.5 t. Since its coming into force, 450 applications on a total of 1,543 vehicles with a volume of 17.8 million euros have been approved under the guideline (status: 05/11/2019). The vehicles are divided into the drive options of natural gas (CNG: 373; LNG 1,101) as well as 69 electric vehicles. By November 2019, 413 allocation decisions (funding volume approx. 14.4 million euros) and five notices of rejection were issued. In this period 848 trucks with energy-efficient and/or low-CO₂ types of drives were documented with binding orders. From the total 20 million euros available, funding in the amount of approx. 6.6 million euros was allocated.

Since 1/7/2018, in addition to federal motorways, all national highways are subject to tolls for commercial vehicles in freight transport with a permissible gross weight of over 7.5 t. Furthermore, on 1/1/2019, new toll rates have come into force with which the infrastructure costs report 2018-2022 was implemented. The toll varies according to emissions class, weight and axles of the vehicle and is composed of clauses for infrastructure, air and noise pollution. CNG and LNG trucks are exempt from tolls up to and including 2020, while electric trucks are exempt indefinitely. From 2021, a reduced toll rate will be paid for vehicles with a natural gas drive. In addition, the BMVI supports the use of LNG as a fuel through the reciprocal financing of the extension of the energy tax reduction for natural gas as a fuel by 2026. Furthermore, the Federal Council ratified the fourth regulation amending the driver licensing regulation in April 2019. The BMVI thereby laid the legal basis so that for example, vehicles with a CNG drive up to 4.25 t permissible gross weight can be driven with the B class (3.5 t) regular driving license. Such an exception has until now only applied to vehicles with a battery drive.



NOW GmbH workshop on urban commercial transport

At the 'Urban commercial transport' workshop in December 2019, organised for the second time by NOW GmbH, solutions were discussed and developed for clean freight transport from the distribution centre to the urban end user. Battery-electric, fuel cell and natural gas drives were considered. The focus was on working out framework conditions, funding instruments, vehicle and infrastructure requirements as well as technological hurdles for a low-emission logistics sector in cities. Based on reports of their experience, almost 40 participants determined fields of activity and strengthened the stakeholder network. The results of the event will be incorporated in a specialist publication and in the shaping of additional funding measures in the area of commercial vehicles with alternative drives.

Also at the workshop a first insight was offered into the findings of the 'Urban commercial transport' market analysis commissioned by NOW GmbH. Prognos AG and KE Consult processed these findings in 2019, with publication of the analysis planned for the beginning of 2020.

LATEST DEVELOPMENTS IN PUBLIC TRANSPORT

Compared to private transport, public transport has a greater transport capacity with less land use and lower emissions. Energy consumption and harmful pollutant emissions are significantly lower per passenger than those of private transport at the relevant occupancy rate. The shift of passenger transport to public transport is therefore an important factor for the reduction of emissions in the transport sector.

At present bus transport is almost entirely based on the use of diesel-operated vehicles. Irrespective of the effect of the shift, changing the type of drive used in public transport can already make a significant contribution to climate protection. Natural gas and hybrid applications and specifically the electrification of bus drives through overhead lines, battery and fuel cell solutions can lay the groundwork for low-emission mobility. However, as local public transport only rarely breaks even and is therefore reliant on additional public funding, the cost-intensive establishment of innovative technologies poses enormous financial challenges to many public transport companies.

In the autumn of 2019, the federal government published the Climate Protection Programme 2030. There an objective is formulated to further advance the modernisation and climate-protecting retrofitting of bus fleets through boosting funding for buses with alternative drives. Over the longer term, up to 50 per cent of urban buses should operate electrically by 2030. A major increase in funding activities is required here.



MFS pilot projects on alternative drives in public transport

In the framework of the MFS, various studies and pilot projects on alternative drives and fuels in public transport were conducted.

For example, over the course of the projects on **Equipping and retrofitting bus depots for supplying a fully battery-electric bus fleet**, a Hamburger Hochbahn AG (HOCHBAHN) bus depot and the Hamburg-Holstein GmbH (VHH) transport company were each fitted with electric infrastructure to recharge electric buses. Each involves different infrastructural concepts, which were scientifically examined and evaluated by the Helmut Schmidt University (HSU).

In the project, HOCHBAHN set up the newly constructed Alsterdorf depot as the first depot in Germany for solely electric bus operation. This includes the power connection to the electrical grid (110 kV connection), the laying of cables on the depot premises and the installation of the first of six car ports with 44 charging devices. The depot has a capacity of 240 buses in all.



Charging of an electric bus at the Hamburger Hochbahn Alsterdorf depot

The VHH is preparing an already existing bus depot for the deployment of up to 134 electric buses, including the connection to the medium-voltage grid (10 kV connection), laying of electrical lines on the depot premises and the installation of transformers. The charging infrastructure can be extended in a modular way and has initially been designed with three charging modules for a total of 48 vehicles.

The latest state of play is that the basic charging infrastructure, the necessary energy supply as well as the charging technology at both depots has already been installed. HOCHBAHN has already installed all charging devices in the project that were planned. At VHH, 32 charging stations have already been constructed, with a further 16 to follow over the course of 2020. As part of the accompanying research, analyses on the reliability as well as on the different charging scenarios to reduce peak demand will be conducted. A portion of the project results attained thus far has been published in four scientific publications. The BMVI funds both projects under the MFS with a total of 8.6 million euros.

The **BOB Solingen** project examines the vision of a 100 per cent emission-free local public transport on the basis of proven O-bus technology. For this, four battery overhead cable buses (Batterie-Oberleitungs-Busse (BOB)) are being procured which also are driven electrically, separated from the overhead line. In this way a diesel bus route has already been electrified. Through recharging during the journey under the overhead line, downtimes are avoided. The battery capacity (60 kWh) amounts to a mere fraction of the necessary capacity of conventional battery bus concepts, which saves on weight and space for actual passenger transport.

For optimal exploitation of the overhead line infrastructure, it will be developed into a smart trolley system (STS), which connects stationary accumulators, bidirectional charging and PV installations with each other. On the hardware side, new, yet to be developed inverters for PV installations will be used, such as battery storage from disused bus batteries. A direct connection from charging poles for electric cars will also be newly developed. Through so-called 'bi-directional substations', overhead lines and the distribution grid will also be linked. On the software side, all components will be connected for monitoring and controlling purposes. The STS thereby continually monitors the system status. Operational safety takes priority, while the STS optimally uses and manages 'surplus' flexibility in the system according to operating economy and energy efficiency criteria as well as distribution grid requirements.

'BOB Solingen' bus in operation





LATEST DEVELOPMENTS IN RENEWABLE FUELS AND AIR TRAVEL

Aside from introducing new drive technologies, using renewable fuels is an important way of reducing CO₂ transport emissions. Renewable fuels can in general, be manufactured from biogenic reagents (biofuels) on the basis of renewable energy (power-to-liquid).

By introducing renewable fuels, it is possible to reduce emissions in road transport in the existing combustion engine fleets. At the same time the introduction of fuels is relatively simple, as the fuels with today's transport and refuelling infrastructure are compatible and can be mixed with conventional fuels. At present only biomass-based fuels are used in Germany. In 2019 this accounted for approx. 5 per cent and it was used almost exclusively in road transport.

A key future area of application for climate protection is air and maritime transport. Because of the heavy weight and long distance requirements of ocean-going ships and airplanes, batteries and hydrogen reach their technical limits. That is why these modes of transport will remain dependent on liquid fuels in the long term and so in these sectors, renewable fuels are the most important climate protection option at present.

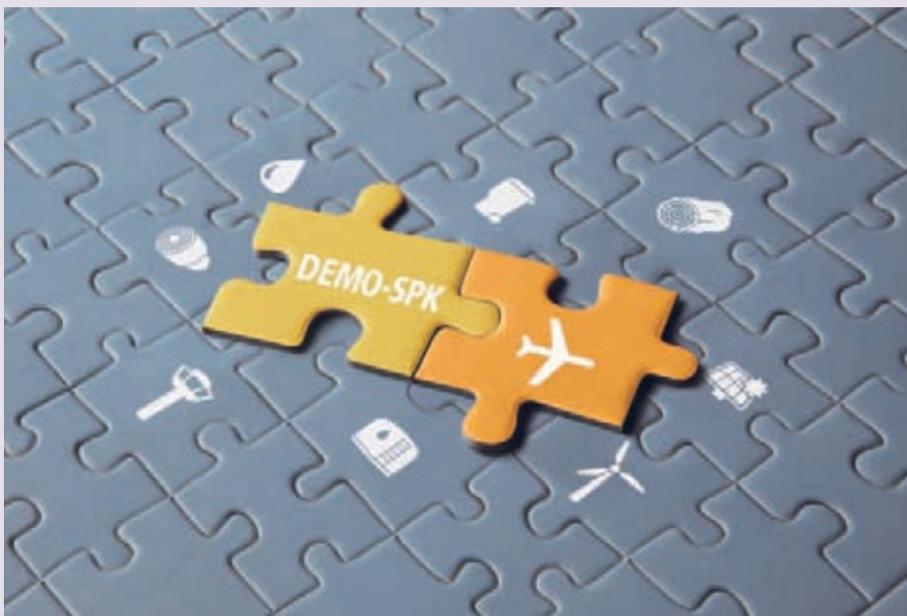
Air transport is currently responsible for around 2.8 per cent of global CO₂ emissions and no other transport mode is growing faster globally. Taking Germany alone, it is calculated that the volume of air passenger transport will grow by 65 per cent from 2010 to 2030, and by 94 per cent for freight. Air traffic is currently based almost entirely on fossil kerosene. Through more efficient airplanes and the optimisation of flight paths and operational procedures, fuel consumption can be reduced and the CO₂ footprint of air transport improved. But these measures alone are not sufficient to compensate for the rate of growth and to achieve climate policy goals. The rapid market introduction of renewably-produced kerosene and increasing shares of renewably-produced kerosene in the airport logistics sector therefore lays an important foundation for climate-friendly air transport.

DEMO-SPK: Demonstration project on the use of renewable kerosene in air transport

During the implementation of the Mobility and Fuels Strategy, the importance of renewable fuels in air transport was recognised early. The state of play of renewable kerosene in the scientific world and in practice was analysed in several studies and the action required was identified for its broad application. On the basis of these findings, the international, and to date, unique research and demonstration project on the use of renewable kerosene was launched at the Leipzig/Halle airport (DEMO-SPK) as a pilot project of the Mobility and Fuels Strategy. It was financed by the Federal Ministry of Transport and Digital Infrastructure.

The use of Multiblend JET A-1 was successfully demonstrated in the overall fuel supply infrastructure in the project. Apart from analyses on the properties of kerosene, DEMO-SPK undertook emission measuring, life cycle analyses and carried out research into practical sustainability documentation as well as credit procedures in emissions trade. More than 20 international partners have made this hitherto unique project possible.

The results are promising: it was possible to show that the supply chain of Multiblend JET A-1 is technically feasible and its use without deviating from normal operation is possible. It was also verified that through the use of Multiblend JET A-1, the particle emissions in the ground test run could be reduced by around 30 to 60 per cent, and CO₂ equivalent emissions by around 35 per cent compared to purely fossil JET A-1. A series of solution approaches and recommendations were developed to make practical use easier.



DEMO-SPK demonstration project logo



Pilot-SBG: Renewable methane as a more advanced fuel

The biofuels used at present are by and large based either on cultivated biomass or on used cooking oil and animal oil/fats. According to the specifications of the Renewable Energy Directive RED II, today's established use of so-called conventional fuels is to be limited. That is why advanced fuels, manufactured on the basis of biogenic waste and residues, are growing in importance. In the future, the use of straw, green cuttings, manure and waste will represent a major raw material base to be able to cover the increasing demand in biofuels. Here the production of biogas as well as its subsequent processing to bio-CNG and bio-LNG is a promising option for shipping and heavy-duty transport applications.

In the Mobility and Fuel Strategy, the pilot project *PILOT-SBG – Bio-resources and hydrogen to methane as a fuel* is currently being implemented. Over the multi-year project, it is being tested to what extent hitherto unused biogenic residues, by-products and waste as supplementary raw material mixtures can be used for the production of renewable methane. The construction of a pilot plant on a pilot scale is planned. In essence the system concept connects anaerobic fermentation with innovative preparatory and treatment processes such as for example, hydrothermal processes, in order to finally supply methane as a fuel by means of a synthesis using renewable hydrogen. Along with this, the relevant location requirements are determined, particularly in order to identify resource potential which can be mobilised as well as suitable existing installations which can potentially be retrofitted following the EEG phase. The subject of the project, too, is preparatory investigations for a demonstration plant which can be built at an appropriate location on a commercial scale. Based on the experience gained from the pilot phase, a technical concept will be developed and a feasibility study will be investigated more closely with respect to availability and spatial distribution of biogenic waste and residues as well as the market development. The project thus makes a major contribution towards tapping into the national sustainability potential for renewable fuels and thus for achieving climate-friendly transport.

Future funding of electricity-based fuels

Because of the limited availability of sustainably-produced biomass and biogenic residues for the production of biofuels, the widespread use of electricity-based fuels will be necessary over the medium to long term. Synthetic fuels can be manufactured on the basis of hydrogen and CO₂, which can replace conventional liquid fuels.

The required production processes are in principle already at a near-to-market stage technologically speaking. There are however, still research and development needs, particularly with regard to the integration of different manufacturing processes (renewable electricity generation, electrolysis, fuel synthesis) and the scaling of the technologies on an industrial level. Other challenges include the availability of renewable electricity, provision of CO₂ for the synthesis process as well as the resulting manufacturing costs.

An important next step is therefore the demonstration of the manufacture of electricity-based fuels in (small to) industrial scale in order to prepare the market ramp-up on a larger scale. High levels of initial investment in manufacturing plants are required. The 2030 Climate Protection Programme calls the closing of research and development gaps as well as the funding of generating plants for renewable fuels an important measure of the energy transition in transport. Through implementing the climate change programme, experience gathered so far with renewable fuels will be accumulated and funding increased over the coming years.



Electricity-based fuels or e-fuels can be produced on the basis of renewable energies and can be used in a variety of transport modes.

LATEST DEVELOPMENTS IN SHIPPING

Second funding call under LNG funding guideline

The BMVI funds the equipping and retrofitting of seagoing ships to use liquefied natural gas (LNG) as a maritime fuel. The market ramp-up of LNG in German and European shipping is being advanced through its own LNG funding guideline. The funds will be supplied from the Mobility and Fuels Strategy.

LNG burns more cleanly than conventional shipping fuel. Apart from having an improved greenhouse gas footprint, LNG ships emit considerably fewer sulphur and nitrogen oxides. The soot and particulate matter emissions are also reduced. Projects which are funded through the guideline for the equipping and retrofitting of seagoing vessels to use LNG as a shipping fuel from 17 August 2017, are contributing to environmental, climate and health protection through this emission reduction. LNG ships need a special supply infrastructure, which at this point still lags behind infrastructure for conventional marine fuel. Therefore it is also the goal of the guideline to increase the demand for LNG as a shipping fuel in Germany and Europe. In this way, incentives for the development of LNG supply infrastructure will be created at ports.

In the first call for submissions under the LNG funding guideline, the new construction of two RoPax ferries and two container ships (see project start for two new container ships by Nordic Hamburg) as well as the conversion of a RoRo ferry were initiated.

In September 2019, a second funding call was published. Ship owners were invited to submit applications for the equipping and retrofitting of sea vessels with LNG technology by 18 December 2019. A portion of LNG-related additional costs can be subsidised, the amount of which is dependent on the size of the company. A large number of applications have been submitted and are being reviewed.

Project start for two new Nordic Hamburg container ships

Aside from the TT-line and AG Ems projects presented in the NOW GmbH 2018 annual report, two Nordic Hamburg shipping company container ships were also equipped with LNG systems using MFS funds in the first funding call. The presentation of the subsidy note by the BMVI at the beginning of 2019 signalled the green light for both projects.

Both new builds have over 1,400 container spaces. In addition to the LNG main drive, the auxiliary engine and the auxiliary boiler, which supplies the onboard heating system with steam, will operate with LNG. In contrast to operating a conventional energy supply system, both Nordic LNG ships will emit substantially less emissions. Greenhouse gases equivalent to the amount that around 1,000 medium-class cars produce will be saved by each ship each year. For nitrogen oxides, savings totalling the equivalent of 300,000 such cars will be made. Furthermore, compared to using regular marine diesel, sulphur oxide emissions, particulate matter and soot are almost completely eliminated through the use of LNG.

At present, both projects are in the planning phase. In particular, contracts with suppliers and the shipyard are being finalised. Both ships are to be deployed from the beginning of 2020 or the end of 2021 as a feeder service in the North and Baltic seas. It is planned that they receive LNG by bunker vessel in Hamburg and Rotterdam. Through the demand for fuel, both container ships are also contributing to the expansion of the LNG bunker infrastructure.



The already operating MV 'Containerships Nord', very similar to the subsidised ships, is a 1,400 TEU dual fuel container ship, owned by the Nordic Hamburg shipping company.

The Atair is designed for operations in the North and Baltic Sea and the North Atlantic, and will enter service in the course of 2020. The LNG-powered research vessel of the Federal Maritime and Hydrographic Agency will carry out geological and oceanographic surveys, among other things.



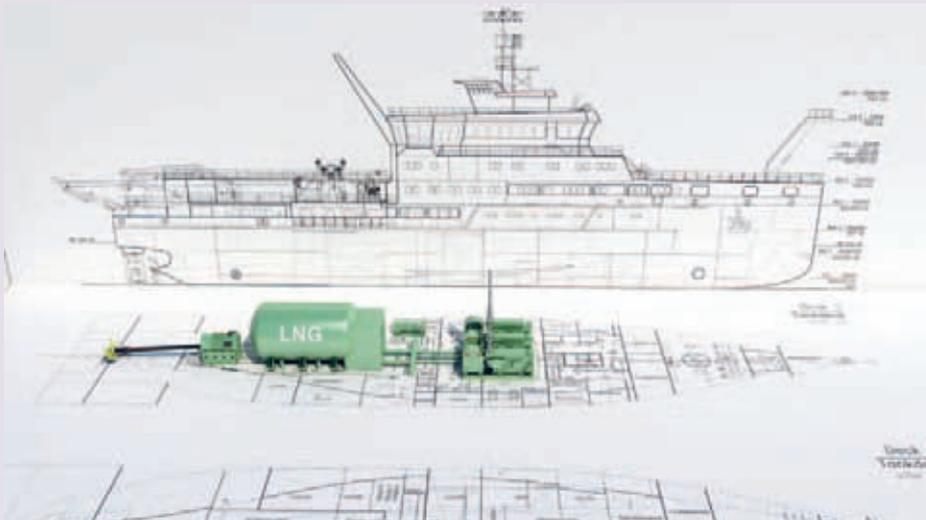


Launch of LNG-operated research ship, Atair

The state of the art LNG-operated research ship, Atair, of the Federal Maritime and Hydrographic Agency, was built by the Fassmer shipyard. The ship's launch was on 30 September 2019, with commissioning following in 2020. The LNG-related additional investment costs are funded from MFS monies.

The new, roughly 75 m long and 17 m wide research ship has an LNG tank with a volume of 130 m³, which is enough to operate Atair's dual fuel engines for ten days predominantly with LNG. The ship will be deployed for hydrographic surveys in the North and Baltic Seas as well as in the North Atlantic, for wreck search and for oceanological research work.

The new Atair replaces its predecessor dating from 1987. Installing an LNG drive on the Atair signals the beginning of the remodelling of the federal fleet for environmental friendliness. Two LNG-operated new builds will in future replace the conventionally run multi-purpose vessels Mellum and Scharhörn of the Federal Waterways and Shipping Administration. An LNG-operated customs vessel will reinforce the federal fleet at a later stage.



The components of Atair's diesel gas-electric propulsion system: two dual-fuel engines (LNG and diesel), LNG tank and the electric motor.



The prototype of the LNG PowerPac, a mobile containerised solution for shore-side power supply, undergoes a 24-hour test operation at the Burchardkai container terminal in the Port of Hamburg in June 2019.

Funding environmentally-friendly onboard electricity and mobile shoreside power supply

Many port locations are impacted by high levels of air pollution which are emitted by ships during port laytimes. Usually ships power themselves using their own onboard diesel engines. Using shoreside electricity or onboard electricity from more environmentally-friendly alternative fuels offers an alternative to this.

Apart from stationary shoreside power plants, mobile (containerised, rolling or swimming) shoreside power supply systems can provide an alternative for different shipping applications. An example already illustrated in the 2018 NOW GmbH annual report for mobile power supply in ports are the LNG PowerPacs from the Becker Marine Systems company, which was funded as an MFS pilot project. These were containerised, LNG-operated generators which supplied ships with electricity through transfer systems during port laytimes. Other alternative technologies for onboard power supply include for example, plug-in systems for shoreside electricity, batteries, fuel cells or gas generator sets (with gas engines or gas turbines), which are operated using alternative energy sources, such as shoreside power supply, hydrogen, natural gas as well as biogenic or electricity-based fuels, for example, methane, ethanol, methanol or ammonia. Compared to diesel engine power generation, the alternatives are however, less economically efficient and therefore are only used by a few ships.

To support the technological market ramp-up, a separate budget item was created under MFS in the federal budget and released for management in 2019. This budget item enables the BMVI to support environmentally-friendly onboard as well as mobile shoreside power supply of seagoing and inland waterway vessels. This will increase the economic efficiency and thus the appeal of alternative power supply solutions. A funding guideline for the widespread market activation of environmentally-friendly onboard and mobile shoreside energy supply will be published in 2020.

V. ACCOMPANYING RESEARCH AND MONITORING

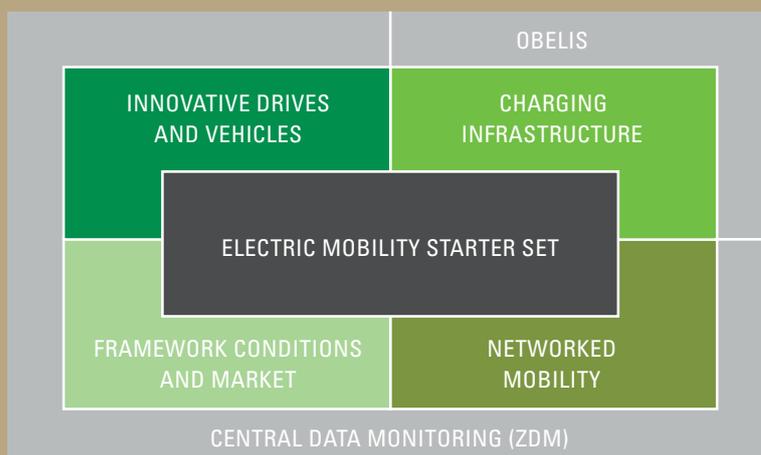


ACCOMPANYING RESEARCH AND MONITORING

Accompanying research for the BMVI's federal funding for charging infrastructure and local electric mobility is a key aspect of programme implementation. Its objective is to support the market ramp-up by providing focused content-related support for the two federal funding programmes within the four thematic areas of charging infrastructure, framework conditions and market, innovative drives and vehicles, as well as networked mobility.

The accompanying research is based primarily on the consolidation and evaluation of the project results from the three funding areas of vehicle procurement, electric mobility concepts and R&D projects of the local electric mobility funding programme as well as the analysis of the structure and use of the subsidised charging columns of the charging infrastructure funding programme for electric vehicles. In the area of project-based accompanying research, there is also a regular exchange of information with all participating companies and organisations. Accompanying research is therefore also a network for knowledge transfer at project and programme level and thus makes a significant contribution to bringing together the individual results of the projects at the overall programme level.

The four thematic areas are flanked by data collection in the Central Data Monitoring (ZDM – Zentrales Datenmonitoring) and data collection in the context of the Online Reporting Charging Infrastructure (OBELIS – Online-Berichterstattung Ladeinfrastruktur). The communication of the results of the accompanying research activities is bundled within the Electric Mobility Starter Set or directly handed over to the relevant stakeholders of the topic areas and to the municipal players.



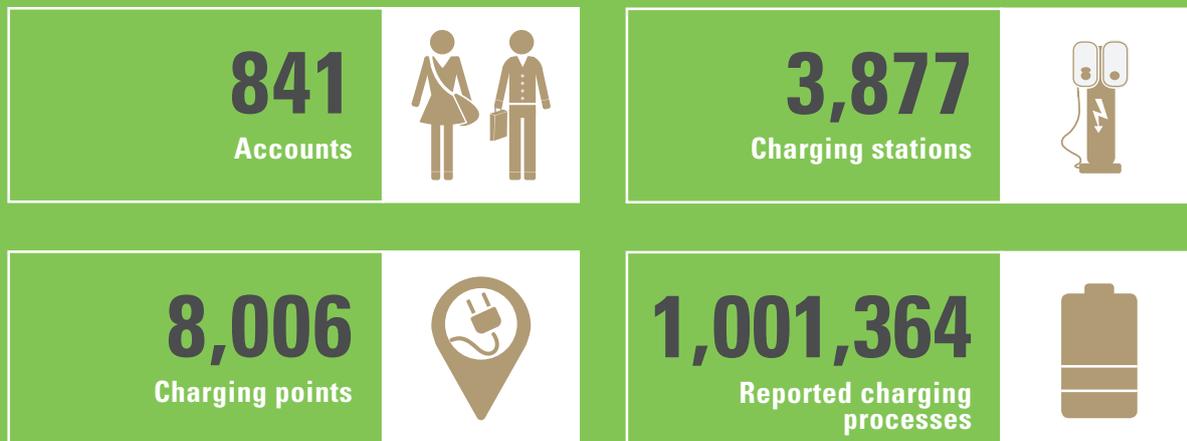


THEMATIC AREA “CHARGING INFRASTRUCTURE”

The aim of the accompanying research in the field of charging infrastructure is to provide analytical support for the nationwide development of public charging infrastructure and its use and to derive recommendations for action for the national expansion strategy in the field of charging infrastructure in Germany.

The focus here is on the collection and evaluation of the semi-annual reports submitted in the context of the reporting requirements of the charging infrastructure funding guideline, which contain both master data and operating data of the funded charging stations. The OBELIS online platform has been active for this purpose since February 2019, via which funding recipients can submit their data. Up to now, data from three semi-annual reports has been collected via OBELIS. As of 2 February, 2020, 841 accounts were registered with OBELIS and 3,877 charging stations with a total of 8,006 charging points were recorded. For these charging points, a total of 1,001,364 charging processes were reported.

The data recorded serve to analyse the development and use of the funded charging infrastructure and flow into the model calculation of the StandortTOOL location tool. Initial analyses of economic efficiency, price models and for defining capacity utilisation have already been presented at international conferences and specialist trade fairs.



Data collection via OBELIS, as at 07.02.2020

State	No. charging stations	No. charging points	Charging processes recorded
Baden-Württemberg	765	1,557	247,414
Bavaria	575	1,212	176,805
Berlin	27	36	11,589
Brandenburg	111	222	13,845
Bremen	43	88	10,017
Hamburg	259	521	33,610
Hesse	163	346	72,502
Lower Saxony	524	1,022	107,514
Mecklenburg-Western Pomerania	7	14	2,210
North Rhine-Westphalia	584	1,201	161,394
Rhineland-Palatinate	247	543	76,882
Saarland	39	89	5,718
Saxony	136	338	25,463
Saxony-Anhalt	77	161	1,730
Schleswig-Holstein	188	380	30,080
Thuringia	132	276	24,591
Total	3,877	8,006	1,001,364

Data collection via OBELIS, broken down by federal state



THEMATIC AREA: NETWORKED MOBILITY

Networked mobility accompanying research is focused on building and developing competencies on the municipal level with regard to holistic mobility strategies and their associated measures. Two intersections have been considered key so far: firstly, the dovetailing between different electric mobility applications and their users and secondly, the interface between electric mobility and the energy industry.

The results of the thematic area are divided according to three key questions:

- What is being done now? – Capturing the status quo
- What remains to be done? – Strategy development on the municipal level and
- How will it be done? – Operative implementation



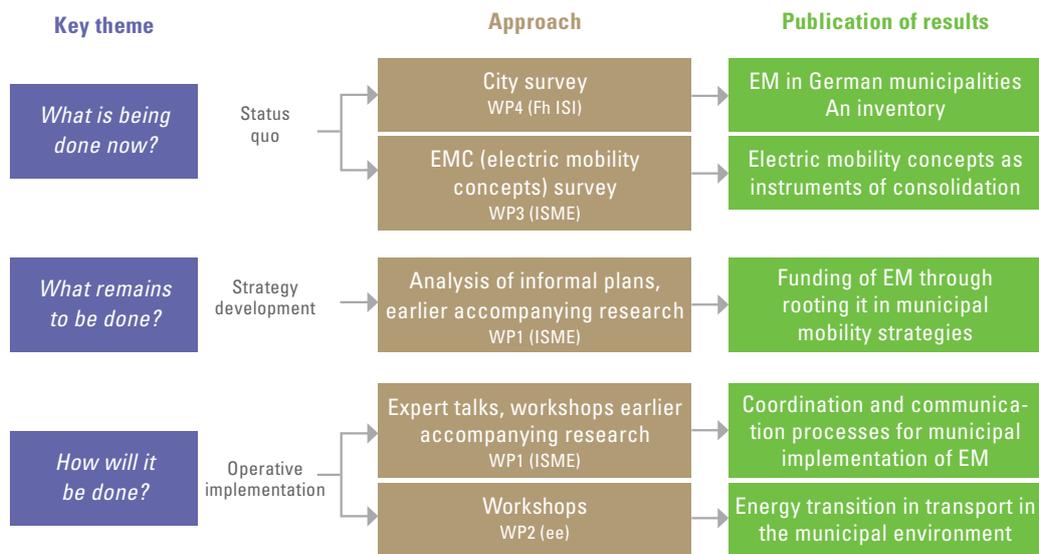


Figure 1: Activities and results of the accompanying research structured in work packages on the basis of key questions

What is being done now?

In summary, the results obtained to date indicate that in terms of municipalities, the state of play can be described as follows:

- On the municipal level, the topic of electric mobility has spread across Germany on a national scale.
- The potential of electric mobility focuses on public perception and the environment.
- The energy transition in transport: implementation is still in its infancy.
- The Electric Mobility Act is still underutilised.
- The legal framework determines the conditions.

The value of the topic of electric mobility is deemed high (54 per cent) or very high (13 per cent) by almost 70 per cent of municipalities surveyed. In all, 80 per cent of surveyed cities and local authorities are active on the issue of electric mobility. As municipality sizes increase, so does the share of active municipalities. The survey also shows that the vast majority of municipalities already have the first public charging columns (90 per cent of active municipalities) and electric vehicles as part of municipal fleets (86 per cent of active municipalities).

For local authorities, electric mobility is first and foremost positively perceived and seen as contributing to environmental protection. In future it is also worth approaching electric mobility by including previously lesser emphasised topics such as carsharing, the link to ecomobility and commercial fleets as well as engaging and supporting local business.

Stakeholders display a very strong interest in driving the energy transition in transport forward. However there is often a lack of qualified personnel or personnel capacity in municipal administrations to be able to tackle sector-coupling projects. In this regard municipal utilities in particular can be helpful as both supporters and service providers for municipal administrations in terms of implementation.

One third of active municipalities surveyed in the city survey indicate that measures from the Electric Mobility Act (EmoG) are currently being implemented, or will be in future. The focus of the implementation thus far has been on possible parking priorities. A large group of municipalities however, still show a high level of uncertainty on this issue, which is reflected in the city survey in that 40 per cent of the questions about the Electric Mobility Act are answered with a 'don't know'. Furthermore there is, in particular, an information deficit on effective and legally sound implementation.

In order to map these framework conditions, an 'Electric mobility legislative map' was created within the networked mobility accompanying research. The legislative map contains a collection of key strategies, laws and regulations on the issue of electric mobility on European, federal, state and municipal levels.

What remains to be done?

Primary objectives which should be tackled as quickly as possible on the municipal level are:

- The engagement of the housing sector for both new and existing buildings, especially multi-family buildings via owner associations and cooperatives.
- Aspects of city logistics, particularly the already available privileges in combination with a clean air plan (as per the Federal Immission Control Act, BImSchG) and separate access restrictions (as per the Road Traffic Act, StVG in line with EmoG implementation)
- Sector coupling, and in this respect also
- Electrification of local public transport, which many municipalities are already making great efforts to implement, and where the challenges are primarily, inadequate manufacturing product range, long delivery times and a lack of flexibility of the licensing model as well as
- The anchoring of specific measures in strategy papers

As the city survey has shown, only some of the municipalities so far have incorporated the topic of electric mobility in strategy or planning papers. Furthermore, hardly any quantitative targets have been defined up to this point. Specifically, the building of infrastructure in many municipalities is still not based on a needs assessment for scaling or for other strategic planning purposes. The evaluation of other strategy papers including climate protection concepts, transport development plans and Green City master plans also shows a lack of thorough planning on a strategic level. Activities are here often still superficially designed and do not include specific implementation aspects (e.g. required stakeholders and resources, technical and legislative challenges and potential). Because of a lack of resources, it is primarily smaller municipalities that are still not addressing the 'entry point' areas of activity. That is why the creation of a central plan is recommended to implement electric mobility.

Aside from the topics currently identified as being more significant (electrification of the housing sector, city logistics and public transport as well as sector coupling and formulating strategy papers), in the brochure: 'Funding of electric mobility by rooting it in municipal mobility strategies', a number of other options were prepared to advance electric mobility on the municipal level under the four building blocks of motorised transport, public transport, bicycle transport and intermodality. Apart from the thematic incorporation of electric mobility in mobility strategies, a better formal integration is crucial.

On the issue of sector coupling, when formulating funding programmes there should be interaction between the four elements of electric vehicles, RE plants, storage systems and energy management. On the federal level, further improvements in conditions for 'renter electricity' (Mieterstrom) as well as the creation of a legal basis for a solar roof statute would also contribute to strengthening the supply of electric vehicles with local RE electricity.

In the legal framework, action required in the area of sector coupling has been identified as the following: the installation of charging infrastructure in existing buildings, particularly in residential property law and tenancy law, as well as the alignment of the definition of the final consumer in renewable energy law (EEG) to EnWG definitions and electricity tax law. The incentives for electric vehicles in municipalities were examined, designed and presented for the revision and amendment of the Electric Mobility Act. Further results on this can be found in the brochure 'Energy transition in transport in the municipal environment – coupling of the transport and electricity sectors for municipalities, municipal utilities, distribution system operators and transport companies'.



How will it be done?

Aside from broadening the thematic emphases (see topics in 'What remains to be done?') this will be undertaken through strategic implementation. This includes the broad utilisation of all roles the municipality can assume in this context (➔ **Figure 2**).

Because of the large number of possible topics/areas of activity, implementing electric mobility in municipalities affects broad sections of municipal administrations, albeit to widely varying degrees. Organisational restructuring is potentially needed to create resources and competencies, to establish powers and, where appropriate, to make the development of electric mobility in the municipality less dependent on the commitment of a single/a few employee(s).

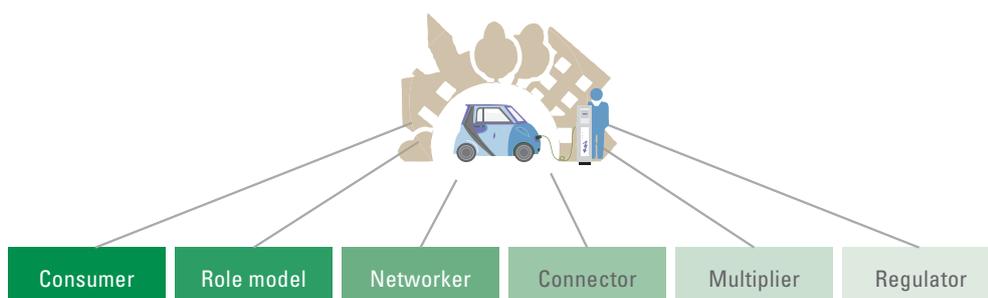


Figure 2: Potential roles for municipalities in implementing electric mobility

Furthermore, other stakeholders need to be involved, simply outlined in the following stakeholder map (➤ **Figure 3**). Lastly, inter-municipal cooperation is relevant in terms of commutes, standardised operating or utilisation structures for charging infrastructure, regional carsharing services or intermodal services. Detailed elaboration in the form of 32 tried and tested formats as well as numerous practical examples can be found in the 'Coordination and communication processes of the municipal implementation of electric mobility' brochure

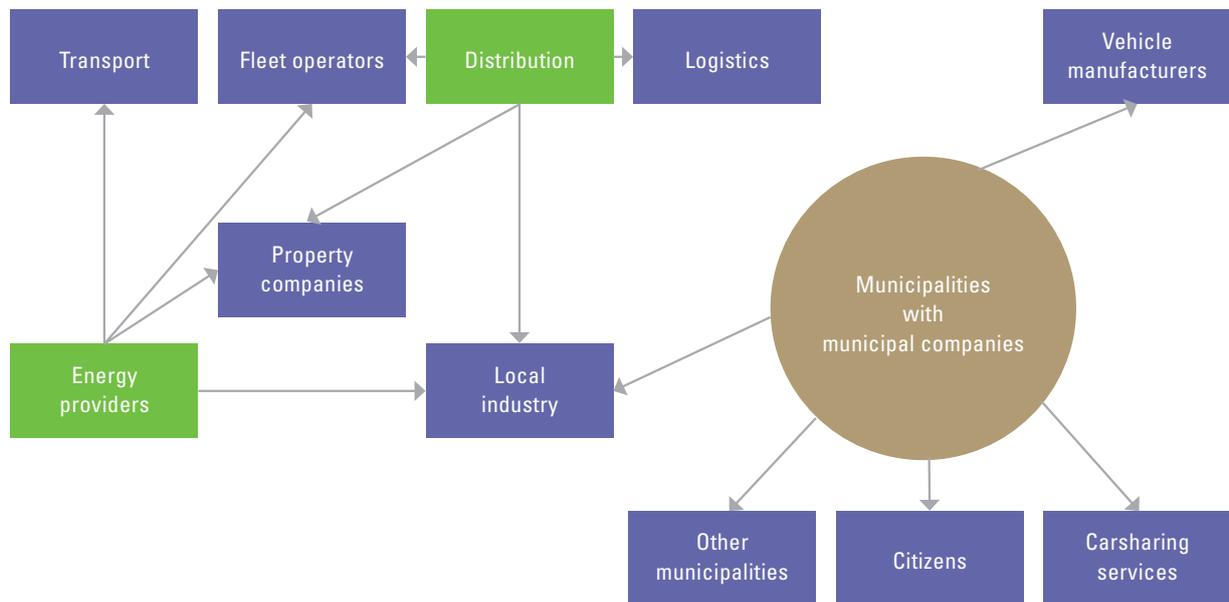


Figure 3: Stakeholder landscape for electric mobility activities on the municipal level

In the context of studies on the energy transition in transport, an overview was created which illustrates the linking of the municipal administration with selected subsidiary companies, thereby generating a specified stakeholder map for this area. The emphasis here is on mobility and green electricity (➤ **Figure 4**). The dark blue lines show municipal administration instruments used to assign the respective subsidiary companies their energy transition objectives for transport. The subsidiary companies' services for the municipalities are described in the light blue banners. There are also various interconnections represented by the light blue arrows.

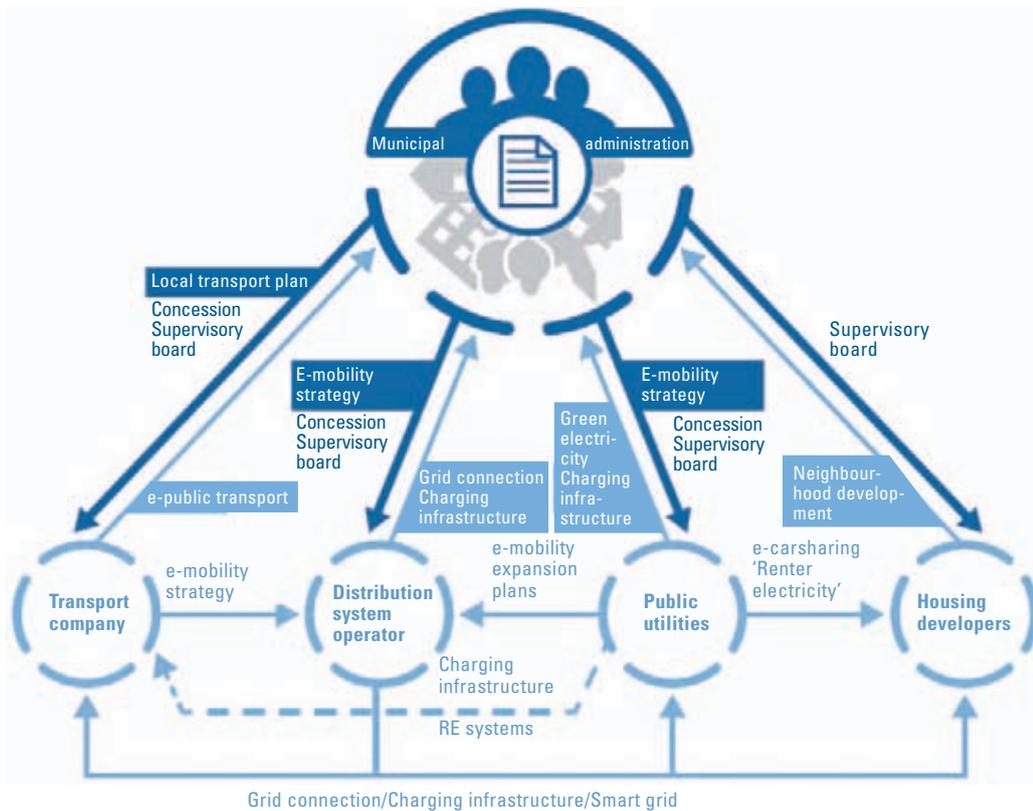


Figure 4: Stakeholder and relation map for municipal sector coupling between the electricity/energy system and the transport system

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- EE ENERGY ENGINEERS, Gelsenkirchen
- Noerr LLP, Munich

INTERACTIVE CATALOGUE OF MEASURES FOR MUNICIPAL MOBILITY STRATEGIES

The networked mobility accompanying research details a collection of objectives and measures published in the brochure: 'Funding electric mobility through rooting it in municipal mobility strategies'. To improve the usability of this collection of measures, an interactive catalogue of measures for municipalities was developed for the Electric Mobility Starter Set (➤ www.starterset-elektromobilitaet.de).

The goal of the catalogue of measures is to support municipalities in the systematic development of mobility strategies for the introduction of electric mobility, in which individual measures are always assigned to practical objectives from e.g. transport development plans and climate protection concepts. The measures are accompanied by successful examples from municipalities (good practice) that have already gained the relevant experience.

The resulting tool shows potential objectives and the associated subgoals and measures for four areas: intermodality, motorised transport, public transport and bicycle transport. Municipalities can pick out the appropriate elements for them and save them in a manageable wishlist.

In the area of 'Motorised transport', users find goals such as 'Nationwide, managed roll-out of charging infrastructure', 'Incorporation of electric mobility in urban planning' or 'Electrification of fleets'. Subgoals are then assigned to the goal of the charging infrastructure development, which are geared towards public, semi-public and private charging infrastructure. Suitable measures are suggested like for example, streetlamp charging and how locations could be determined.

➤ **The catalogue of measures:**

https://www.starterset-elektromobilitaet.de/Bausteine/Fahrplan_Elektromobilitaet/#massnahmenkatalog



Figure 1: Example of structure of catalogue of measures in the motorised transport area with goal, subgoal and measures



1.4. Thematic area: Framework conditions & market

The market development in electric vehicles gained momentum again in 2019. On an annual average, the market share of battery and plug-in hybrid electric vehicles was over three per cent of the entire vehicle market. The existing numbers are still rather small compared to conventional drives. For the foreseeable future, the ongoing market ramp-up of electric mobility and the transformation process towards sustainable mobility will continue to rely very significantly on political and legal framework conditions.

The examination of the interplay of market development and political and societal framework conditions in terms of electric mobility are at the core of the accompanying research. It analyses and evaluates political and regulatory framework conditions in Germany, evaluates specific political incentive instruments and compares the German conditions with those in other countries. It observes and analyses market development in Germany and selected international markets and tries to understand the processes and dynamics of market formation and the diffusion of electric mobility. The accompanying research pays special attention to the examination of procurement processes as well as the integration of electric vehicles in municipal and commercial fleets.

Tasked with the accompanying research 'Framework conditions and market' since 2016, under the leadership of TÜV Rheinland, the scientific consortium published its final publication in the spring of 2019 (see NOW annual report 2018). The report can be downloaded from the NOW website. New tendering of the accompanying research will be issued at the beginning of 2020.

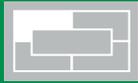
In the context of the thematic field 'Framework conditions and market', the leasing dialogue process initiated by NOW in autumn 2018 and participated in by the political, administrative and the leasing sectors, was continued over the course of 2019. Leasing is particularly important for the procurement of new cars. Around 40 per cent of newly registered cars are financed through leasing. This is also reflected in the funding programme. Almost 50 per cent of approved vehicles under the procurement funding scheme were applied for by leasing companies.

In the framework of the leasing dialogue process coordinated by NOW with the support of hySOLUTIONS GmbH, two one-day events with representatives from the leasing sector took place in the BMVI. In addition, numerous bilateral talks with the 12 leasing companies participating in the process took place. Parallel to this there was an exchange with the regional project management centres in order to support the dialogue with the leasing companies in terms of content.

The aim of the dialogue process was and remains, to better synchronise funding and leasing practice and thus increase the effectiveness of the use of state funds. Leasing can in this way become a major lever for the market ramp-up of electric mobility. The first phase of the process ended in June 2019 with a final report. 16 potential improvement measures were defined in it which underwent critical evaluation. How residual values can be stabilised, and how the funding of extra rebates in the leasing services of e-cars can be made more appealing were some of the topics discussed. Since then, individual suggestions for the administrative processing of the funds have been implemented. Since the immediate action programme, funding amounts for individual e-car models can be determined in advance and lump sums accounted for in an Excel spreadsheet. This simplifies calculations for leasing companies and increases planning security. In addition, the funding sum in the leasing contracts will be disclosed in a transparent manner in future. The recommendation to ensure continuity in the process has been taken on board by NOW. In December 2019, a third event took place with the leasing companies in the BMVI. A continuation of the process is planned for 2020.

Contact

➤ Coordination of the accompanying research: Marc Weider (NOW GmbH)



THEMATIC AREA: INNOVATIVE DRIVES AND VEHICLES

Over the past few years there was a focus on public transport in the innovative drives and vehicles area. To this end, the programme accompanying research: 'Innovative drives in road public transport' was tendered and awarded in 2018.

In addition to the 'bus' focus, in 2019 NOW GmbH commissioned a study on the assessment of potential of alternatives drives in regional rail transport.

Programme accompanying research 'Innovative drives in road public transport'

The consortium, composed of sphera (formerly thinkstep), Ingenieurgruppe IVV, Fraunhofer IVI, VCDB VerkehrsConsult Dresden-Berlin, hySOLUTIONS and SEK Consulting, already launched in 2018.

Priorities

The focus of the accompanying research in terms of content is on the one hand, monitoring and evaluating the use of currently running electric buses funded by the BMVI through comprehensive data acquisition. The data points to be recorded were already specifically determined in 2017 in 'Minimal data sets to collect research data in electric mobility'. But the focus of the accompanying research is not battery buses alone. Fuel cell buses are also being studied and the recorded data fully analysed. The evaluations of the individual bus operators will be made available. Of particular relevance are for example, the availability, energy consumption and the real range of the buses. In addition, data from research and development projects as well as electric mobility concepts with a focus on public transport are also taken into account in the data evaluation.

Based on the real collected and evaluated data, another focus of the accompanying research is the assessment and comparison of different types of drive and infrastructures. The assessment is based on technical, economic, ecological and operational criteria. As a result, a guide as well as an interactive decision-making aid will be created to support the electrification of large bus fleets.

Parallel to the accompanying research, there is a joint working group of the Federal Ministry of Transport and Digital Infrastructure (BMVI) and the Federal Ministry for the Environment, Nature Protection and Nuclear Safety (BMU) on the issue of innovative bus drives (AG Bus for short). Bus operators, manufacturers, suppliers and representatives from politics and municipalities meet on a biannual basis. The accompanying research supports the structure of the meeting in terms of content and uses this platform to present and discuss the latest results and evaluations.

Achieved results

A new issue of the project overview of all funded electric bus projects was created. In addition to BMVI-funded projects (from the EM, NIP and MFS programmes), the brochure contains BMU projects. The overview is available online in the starter set as a map and as a pdf for download. The printed version is planned for 2020.

In the area of data analysis, the first operational data from bus companies was made available and evaluated. The evaluation is already showing a comparably good availability of e-buses of approx. 85 per cent. By comparison, a diesel bus is at approx. 95 per cent. Further publications were created and published from the accompanying research including a market overview of the available e-buses (battery, fuel cells and battery overhead cable hybrid) as well as of the infrastructure (charging stations and refuelling stations) and an overview of the latest funding opportunities in the e-bus area on the EU, federal and state levels (both available online: [➤ www.starterset-elektromobilitaet.de/Bausteine/OEPNV/](http://www.starterset-elektromobilitaet.de/Bausteine/OEPNV/))

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- hySOLUTIONS GmbH, Hamburg
- VerkehrsConsult Dresden-Berlin GmbH, Dresden
- SEK Consulting, Berlin



Study: Market analysis of alternative drives in German regional rail transport

The potential of trains with alternative drives in regional rail transport in the German rail network is investigated in the study.

Analysis of German route and line networks with a focus on non-electrified regional rail transport

The German rail network is up to 54 per cent electrified (DB Netz and non-state-owned rail infrastructure together). Germany thus finds itself in a medium position in terms of Europe as a whole. 242.5 million train kilometres and thus 36 per cent of the overall service output in regional rail transport in Germany was generated with diesel multiple units (DMUs) in 2017, the largest portion of which in the large states of Bavaria, North-Rhine Westphalia and Baden-Württemberg.

The DLR line data bank comprises around 470 regional lines, which are operated today with DMUs. 57 per cent of the lines included in the data record are less than one-tenth electrified over the entire route length. Half of the lines are shorter than 58 km.

The federal government's electrification programme that has been planned includes an increase in the degree of electrification of the federally-owned rail network from 60 to 70 per cent over the next few years. Together with intermittent expansions on the initiative of the federal states, the deployment of BEMUs will thus be facilitated.

Assessment of the market potential of hybrid drives in regional train transport in Germany

For the period of 2019 to 2038, a total of 132 operation launches of networks or single lines that were relevant to evaluation were identified. In total that potential amounts to 1,800–2,500 new multiple units with alternative drives over this period. The estimated new vehicle requirements suggest that for operation launches from 2023/2024, new hybrid vehicles will in fact be used systematically with neither new diesel vehicles procured nor existing DMUs used.

In total, there are 2.65 billion euros (min) to 3.84 billion euros (max) additional investment costs associated with drive concepts which will be incurred until 2038, based on 1.5 million euros additional costs per hybrid vehicle versus the assessment basis of a DMU or an EMU (2019 prices).

Planned publication

Selected study results are to be published in 2020, including at the electric mobility conference and in the form of a brochure. The contractor, the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt (DLR)), is also planning on publishing selected methods and results at trade events or in specialist media.

➤ www.now-gmbh.de/content/service/3-publikationen/6-querschnittsthemen/now_marktanalyse-schienenverkehr.pdf

Contacts

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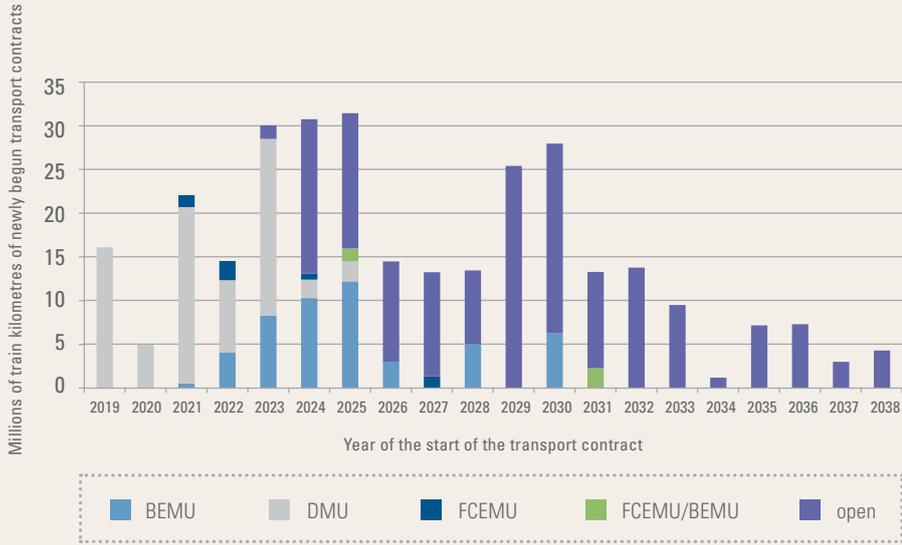


Figure 2: New transport contracts by type of traction in diesel and hybrid vehicle relevant networks until 2038

Current competitor networks and pilot projects with hybrid multiple units including vehicles already on order

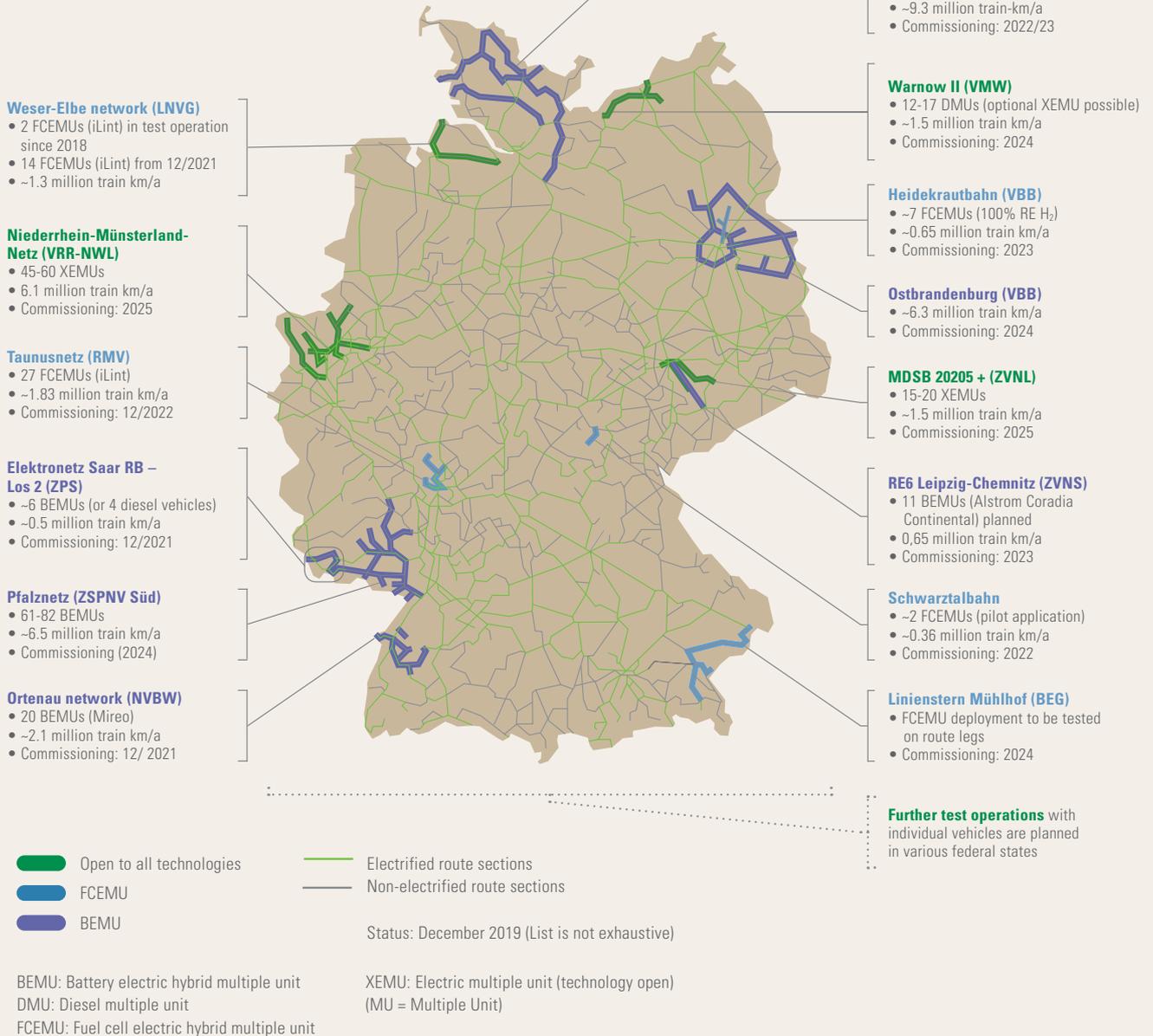


Figure 3: Award procedures & pilot projects for hybrid multiple units in regional rail transport in Germany



Central data monitoring

The programme accompanying research of the BMVI will be supplemented by the Central Data Monitoring (ZDM – Zentrales Datenmonitoring) of the electric mobility funding programme, which will be implemented by Ingenieurgruppe IVV Aachen in coordination with NOW. The ZDM chooses and bundles key data and information from the funding projects and evaluates it. The basis for structured and standardised data capturing is the minimal data sets developed together with the funding and research world.

The focus of the data collection by the ZDM is the driving and charging data of e-cars from the procurement projects as well as the research and development projects. On the one hand, master and operational data on the e-cars and the associated charging infrastructure is collected in regular intervals. On the other hand, the operational data of the e-cars (driving and charging data) is recorded by data loggers. In order to monitor the market ramp-up of the electric vehicles, existing and newly registered electric car numbers in Germany will be stored by the Kraftfahrt-Bundesamt (KBA, German Federal Office for Motor Traffic) in the ZDM database. In addition, the ZDM records the construction of charging infrastructure in Germany. On 31 December 2019, a total of approx. 39 million data points were stored in the ZDM database, 90 per cent of which were driving and charging data of e-vehicles. This makes ZDM probably the most comprehensive data source on electric mobility in Germany at present.

The major work focus of the ZDM in 2019 was equipping approx. 200 e-vehicles from procurement projects in standard and immediate action programmes with data loggers. The data captured gives an insight into the everyday use of e-vehicles in real deployment contexts. Practical experiences help to judge everyday suitability and reliability, as well as the environmental benefits and the economic efficiency of electric vehicles compared to combustion engines. In total approx. 280,000 journeys and approx. 42,000 charging processes were able to be captured.

At the end of January 2020, the commissioning of Ingenieurgruppe IVV for the Central Data Monitoring of the electric mobility funding programme will expire. Key findings of the ZDM will be published at the beginning of 2020 in a final publication. Apart from updating numbers on vehicle inventory and on charging infrastructure in Germany, the market situation and the use of vehicles and charging infrastructure in practice, which were featured in the 2018 ZDM results report, new results were presented. The evaluations of the 2019 data loggers confirm that e-cars are well-suited to municipal and commercial fleets. On both an annual and a daily basis, range needs are met with the current e-vehicle models. From an ecological and economic point of view, the objective should be to organise a stronger capacity through a policy of sharing.

As part of a new assignment for NOW under the electric mobility funding programme, the Central Data Monitoring (ZDM) will be conducted by NOW GmbH itself from February 2020.

Contacts

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-  Contractor: Ingenieurgruppe IVV GmbH & Co. KG

DEVELOPMENT OF ELECTRIC MOBILITY IN GERMANY IN 2019

At the beginning of 2019, more than 180,000 electric vehicles (of all vehicle classes) were registered in Germany. Over the course of the year, approx. 100,000 e-vehicles were added (cf. Fig. 2). At the end of 2019, the number of electric vehicles thereby fell short of the 300,000 mark, but still showed a strong increase. Following a stagnant 2018, 2019 was characterised by a high growth dynamic. With a broader range of vehicles and better vehicle availability, growth might have been even higher. The market share of battery and plug-in hybrid electric vehicles for new registrations in 2019 represented an average of 3 per cent of the entire vehicle market. 63 per cent of electric vehicles registered in 2019 were purely electric vehicles. Thanks to better vehicle availability and advantageous company car taxation privileges, the share of plug-in hybrids grew substantially towards the end of the year. Commercial registrations continue to dominate new registrations at 70 per cent. Given the intensified funding of electric mobility under the Climate Action Programme 2030 adopted by the federal government in autumn 2019, the growing range of vehicles on the manufacturing end and the automotive manufacturers' obligation to adhere to EU emission limit values, the momentum of the electric vehicle market will continue to accelerate in 2020.

The development of charging infrastructure also continued apace in Germany in 2019. The number of regular charging points rose 40 per cent last year according to Bundesnetzagentur (Federal Network Agency) figures. Whereas 7,105 regular charging poles with 14,133 charging points were on the grid at the beginning of 2019, the number increased to 14,133 regular charging poles with 19,920 charging points by the end of the year. Fast-charging increased by almost 30 per cent. The number of fast-charging poles grew from 1,147 at the beginning of 2019, to 1,465 by the end of the year, with fast-charging points increasing from 2,175 to 2,737.

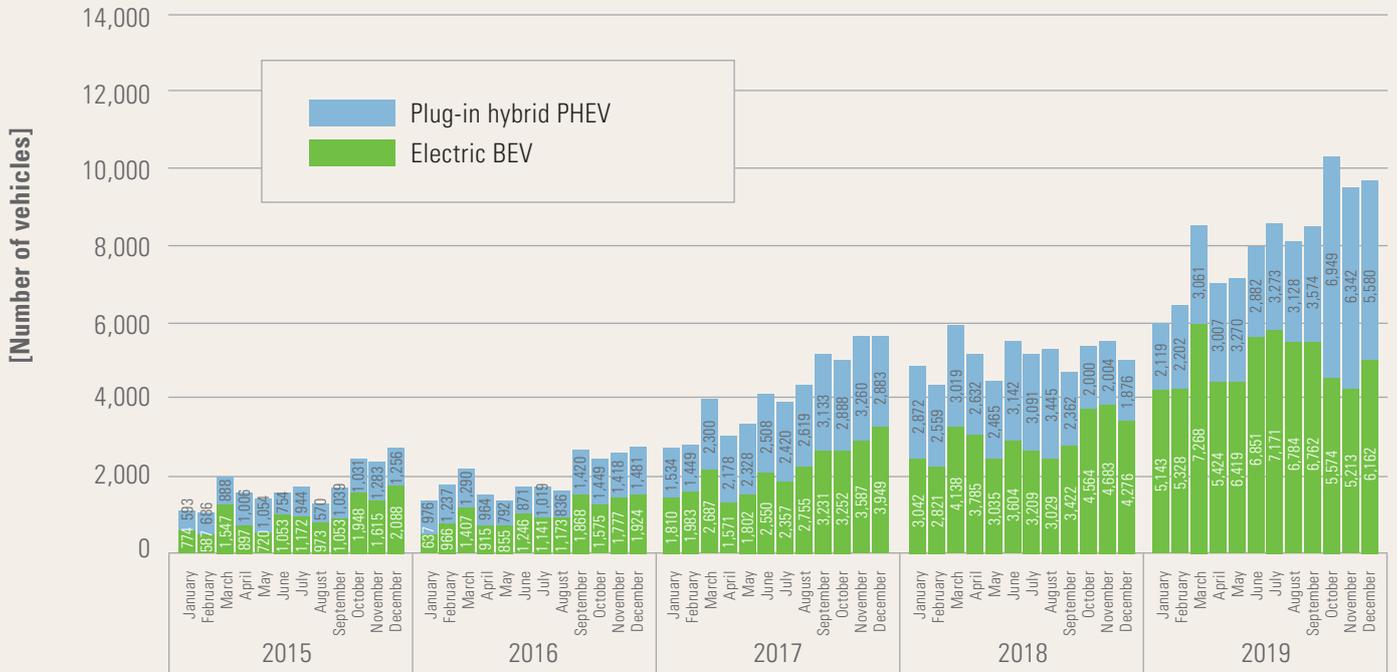


Figure 1: Monthly new registrations according to the KBA (as of December 2019)

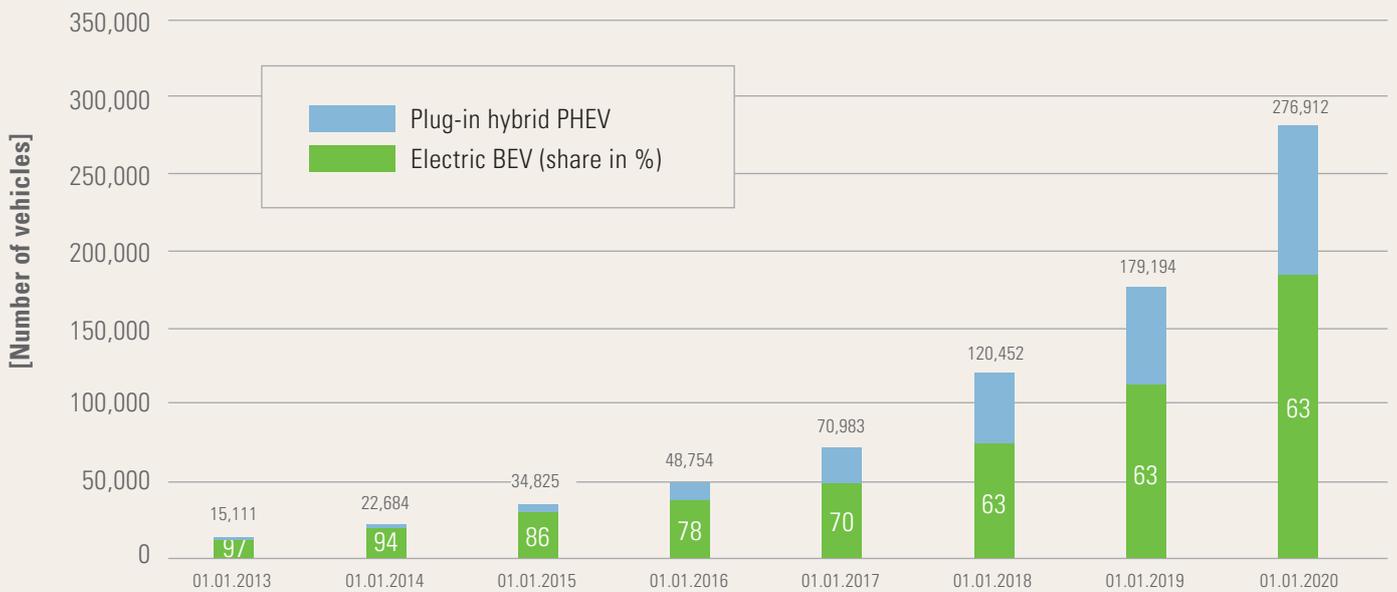


Figure 2: Development of the annual inventory 2013–2018 and accumulated 2019 registrations according to the Federal Motor Transport Authority (as of December 2019)

Source: Federal Motor Transport Authority (KBA – Kraftfahrt-Bundesamt), Flensburg, 2020

AFID MONITORING

When it comes to decarbonisation of transport, electric vehicles and charging poles quickly come to mind. Road passenger vehicle transport currently causes around 55 per cent of domestic transport-related greenhouse gas emissions. However, road freight traffic also contributes significantly to emissions at around 24 per cent, followed by air travel, shipping and rail transport.

Alternative fuels and drives are also required for these modes of transport. Along with electricity, hydrogen is also an emission-free option. Biogenic fuels are already making a difference now. In its present fossil form (in natural gas), methane still reduces emissions and in principle, can be produced through a synthesis of hydrogen in a climate-neutral manner. Climate-neutral synthetic liquid fuels will also potentially have to be used, particularly in air transport.

What is significant however, is that not only vehicle drives have to be changed, but infrastructure has to be built as well, or at least expanded, for the use and provision of electricity, hydrogen and methane. They must satisfy the requirements of each mode of transport and vehicle as well as free movement within Europe. The EU directive on the deployment of alternative fuels infrastructure (2014/94/EU, or AFID) has set precisely this objective. By means of the so-called National Strategy Framework (NSF), it obliges member states to define goals for the building up of such infrastructure and to comply with interoperability standards.

In November 2019, member states were obliged for the first time to submit a comprehensive report on the implementation of the NSF, hence of AFID goal achievement. On behalf of the Federal Ministry of Transport and Digital Infrastructure, NOW GmbH provided the fundamentals of this report for Germany.¹

For this purpose, the inventory numbers of vehicles and infrastructure between 2016 and 2018 were recorded. The underlying data was brought together by NOW GmbH and processed. For car transport, the priority lies in the expansion of charging infrastructure as well as in the building of a nationwide network of hydrogen refuelling stations. The construction of a network of natural gas refuelling stations has begun for trucks, which has recently made significant gains in momentum. In inland waterway and maritime transport, the goal is firstly, to reduce drive emissions through the switch to alternative fuels such as LNG. The refuelling is done primarily by truck but increasingly by bunker vessels and in inland ports, also through stationary systems. Secondly, in order to decrease emissions during laytimes as well, the expansion of shore-side electricity systems

¹ This report is available online: www.bmvi.de/SharedDocs/DE/Anlage/G/MKS/afid-erster-bericht.pdf?__blob=publicationFile

will continue to be advanced. In rail transport, apart from the expansion of the overhead cable network, attention is focused on using innovative drives for non-electrified routes. Two hydrogen fuel cell trains have been in operation since 2018 for the first time, still supplied via a mobile refuelling station. In air travel, the expansion of ground power to supply stationary aircraft at terminal positions has been largely completed.

Measures to support the use of alternative fuels taken by the federal government and the federal states between 2016 and June 2019 were compiled for the first time in the report.² What is unique about the AFID report is that it records the use of all alternative fuels in all transport modes, while also taking fuel production, infrastructure and vehicles in consideration. Apart from research funding and procurement programmes, administrative, legislative and coordinating measures were incorporated. The breadth of the measures registered is apparent from the following diagram. In all, the report provides an overview of 75 measures on a federal level, and 105 measures on the federal state level.

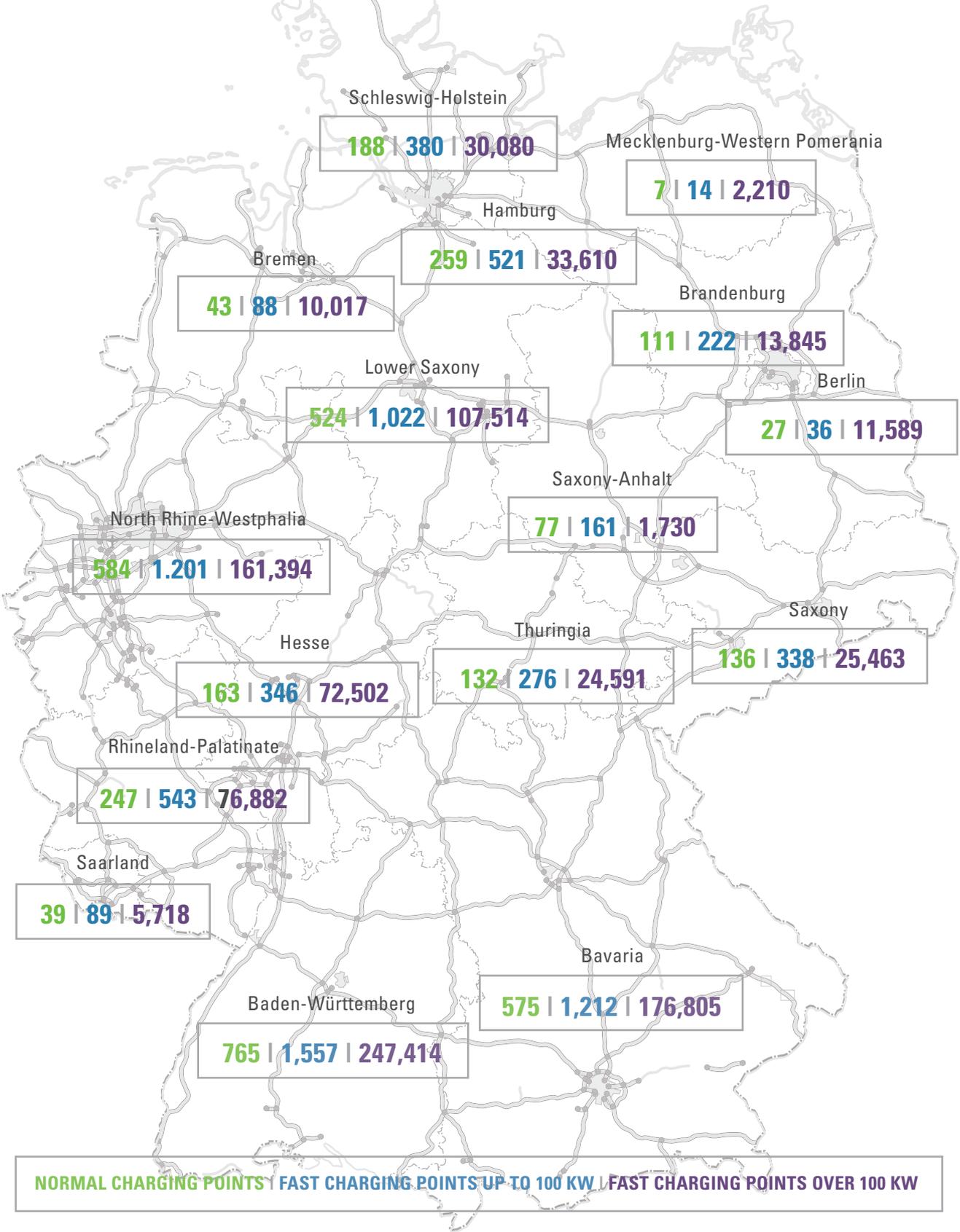


Diagram of the measures by the federal government and states in the AFID report.

² The measures of the Climate Action Programme 2030 of the federal government from October 2019 are thus not contained in the AFID report.



DISTRIBUTION OF CHARGING POINTS IN THE FEDERAL STATES BY CHARGING CATEGORY



NORMAL CHARGING POINTS | FAST CHARGING POINTS UP TO 100 KW | FAST CHARGING POINTS OVER 100 KW

Total

3,877 | 8,006 | 1,001,364

Funding by:



following a resolution by
the German Bundestag

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