



MAchUP

**D3.7: Electrical vehicles and charging stations roll-out in Dresden –
First version**

WP 3, T 3.5.1

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List of Abbreviations

DWG	Drewag
VON	Vonovia SE
FHG	Fraunhofer-Institut für Verkehrs- und Infrastruktursysteme
DVB	Dresdner Verkehrsbetriebe
DRE	Stadt Dresden



List of Acronyms

CHP	Combined heat and power
DH	District heating
EV	Electric vehicle
GDP	Gross domestic product
GHG	Greenhouse gase(s)
HH	Household(s)
IUDP	Integrated Urban Development Plan
LHD	Landeshauptstadt Dresden – City of Dresden
RES	Renewable energy sources
SECAP	Sustainable Energy and Climate Action Plan
SUMP	Sustainable Urban Mobility Plan



Abstract

This task focuses on the growth of electrical vehicles car fleet and further build-up of charging infrastructure. The actions include specific activities of all partners in order to strengthen their car fleet with electrical cars and the construction of additional charging points.

The smart management of this infrastructure requires the integration of electric mobility into the smart grid, uniform data security and data protection concepts as well as uniform operating standards (including registration and payment procedures).

All actions are implemented in Smart City District of Johannstadt. Furthermore, these actions will include the integration of renewable energy systems as well as energy saving technologies. The whole implementation process is monitored and evaluated in order to develop a business model for energetic transformation leading to energy cost reduction.



1 Introduction

1.1 Purpose and target group

This report constitutes Deliverable “D3.7: *Electrical vehicles and charging stations roll-out in Dresden – 1st version*”, which is the main outcome of Task “T3.5.1 *Deployment of electrical vehicles and Charging Infrastructure*”. The final version of this report (i.e. D3.19) will be delivered in September 2020 (project month M36).

One of the core objectives of this document is to describe the detailed design of the interventions. The subtask “Deployment of electrical vehicles and charging infrastructure” focuses on the description of the plan to replace the municipal fleet with 100% electric vehicles. It includes the integration of the infrastructure in smart grid. Following actions are included in this subtask:

- Action 19: E-mobility for public sector: 40 e-vehicles
- Action 22: 36 Charging Points and 2 Fast-Charge Stations to improve Charging Infrastructure
- Action 40: 5 e-cars for housing sector

1.2 Contribution of partners

Table 1 depicts the main contributions from MAtchUP partners in the development of this deliverable.

Table 1: Involvement of Partners

Participant	Contributions
DWG	Action 19; Action 22; Action 40
DRE	Action 19; Action 22
VON	Action 40
FHG	Action 19; Action 40
DVB	Action 19

Table 2: Contribution of Partners

Participant	Contributions
DWG	Deliverable and task responsible party. Adaptation of ToC. Chapters 1 (Introduction), 2 (State of the art and future vision), 3 (Technical definition of the interventions), 4 (Executive project description of each action), 5 (Status of the intervention), and 6 (Conclusions). Review of input from project partners.
DRE	Completion of description of actions 19 and 22 in chapters 3, 4 and 5; general review of the draft document.
FHG	Completion of description of actions 19 and 40 in chapters 3, 4 and 5; general review of the draft document.



VON	Completion of description of action 40 in chapters 3, 4 and 5; general review of the draft document.
DVB	Completion of description of action 19 in chapters 3, 4 and 5; general review of the draft document.

1.3 Relation to other activities in the project

Table 3 depicts the main relationship of this deliverable to other actions, while Table 4, includes the main relationship of this deliverable to other activities (or deliverables) developed within MAtchUP. These dependences should be considered along with this document for further understanding of its content.

Table 3: Relation to other actions in the project

Action	Relation to other Actions in the project
A 19	A18; A23; A37
A 22	A18; A11; A23; A24; A67
A 40	A1; A11

Table 4: Relation to other activities in the project

Deliverable	Relation to D3.7
D3.19	D3.7 is the basis for all related follow-up Tasks and Deliverables, thus it is the preliminary version of D3.19
D6.x D1.14	The detailed design of Dresden's lighthouse interventions includes also detailed financial plans and the accompanying business model structure of each single action. It is thus directly linked to WP6 (Exploitation and Market Deployment) and will be an input for the Dresden Replication Plan (D1.14).
D3.2	D3.7 is related to this deliverable of simulations models
D3.4	D3.7 is related to this deliverable of high performance district
D3.8	D3.7 is related to this deliverable of new services of sustainable mobility



2 State of the art and future vision related to Electric vehicles and charging stations roll-out in Dresden

a) State of the art of Energy Infrastructures in Dresden

Dresden as a high-tech location with its leading competencies in microelectronics, software and communication technologies, lightweight construction and battery research, offers the technological basis for the “mobility of the future”. In many of these subareas, international top performances are achieved and world standards set in Dresden.

At the same time, there are discussions about diesel driving bans in cities due to excessive pollutant levels. The aim is to prevent blanket driving bans for certain drive or vehicle types and still reduce air pollution in the state capital of Dresden. Parallel to the technological prerequisites in Dresden’s economy and research sectors, additional municipal activities are necessary. One example of this is the switch to alternative drive systems. The Dresden City Council already discussed the topic of electromobility with the administration in 2009 (“Dresden as Model City for Renewable Electromobility”). With the increasing importance of electromobility, city council resolutions followed, which deepened the topic. This ranges from concrete commissions (“Integrating electromobility and car sharing into Dresden’s urban space”; “Establishing intermodal mobility points in Dresden”) to strategic considerations in the Sustainable Urban Mobility Plan (SUMP) 2025plus¹ and the Integrated Energy and Climate Protection Concept of the State Capital of Dresden 2030².

In recent years, the Climate Protection Unit of Dresden has promoted electromobility in the state capital with a focus on the municipal vehicle fleet as part of the following projects:

- “EmiD” (Electromobility in Dresden)
- “Dresden lädt auf” (Dresden charges)
- „Dresdner Fuhrparkmanagement“ (Dresden fleet management)
- „e-FEKTA“ (Strengthening the city administrations of Litomerice and Dresden in the area of sustainable mobility)

At present time, 25 semi-public/public charging stations at 85 charging points have been realized by DREWAG NETZ as the largest local investor and operator of charging infrastructures.

¹ Sustainable Urban Mobility Plan 2025plus – An overview, Published by: City of Dresden – Urban Development Division of City Planning Office, English version June 2016, Available at: https://www.dresden.de/media/pdf/stadtplanung/verkehr/VEP_2025plus_-_Ein_Ueberblick_EN.pdf

² Integriertes Energie- und Klimaschutzkonzept der Landeshauptstadt Dresden 2030, Published by City of Dresden – Environmental Office, German Version June 2013, Available at: https://www.dresden.de/media/pdf/umwelt/klimaschutz/IEuKK_Dresden_2030_Endbericht_FINAL_20130620.pdf



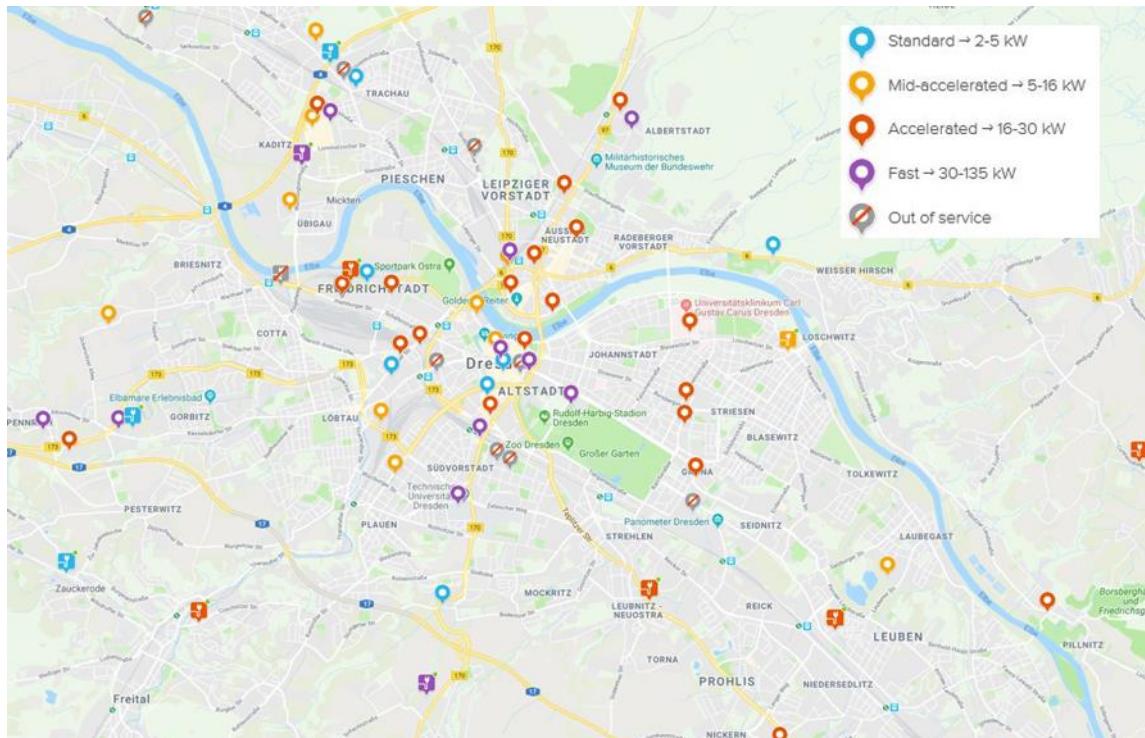


Figure 1: Overview of charging sites in Dresden (source: www.chargemap.com)

b) The future vision of Energy Infrastructures in Dresden

Based on the potentials at the location and the formulated strategic guidelines, a declaration of intent³ was signed by the Mayor of Dresden in 2016 in which the city council commits itself to the following goals:

- Expanding the use of electric vehicles
 - 25,000 electric vehicles in the city area by 2025
 - Pioneering role with municipal vehicles fleet
 - New demand-oriented mobility services
- Creating charging infrastructure
 - Installation of 250 charging stations by 2025
 - Construction of more than 30 intermodal mobility hubs with fast charging stations
- Driving innovations forward
 - Establishment of Dresden as Smart City
 - Urban highly automated driving
 - Implementation of the SUMP 2025plus




The Green City Plan of Dresden⁴ (GCPD) was developed to implement specific measures in the area of mobility (to fulfill the above mentioned goals concerning

³ as part of a cooperation with Volkswagen

⁴ Green City Plan der LH Dresden – im Rahmen des Sofortprogramms Saubere Luft 2017-2020, published by City of Dresden – Urban Development Division of City Planning Office, German version 2018, Available at: https://www.dresden.de/media/pdf/stadtplanung/verkehr/GCP_Dresden.pdf

electric vehicles and charging stations), but also in the areas of air pollution control and climate protection. The GCPD is part of the Federal Government’s “Immediate Action Programme for Clean Air 2017-2020”⁵. Dresden participates in three smart city projects under the umbrella of the “Clean Air 2017-2020” programme as shown in the following

Table 5: DRE involvement in Federal smart city projects

<p>Daten Tanken⁶</p>  <p>© Fraunhofer IVI</p>	<p>The aim is the development of an efficient and network-compatible public charging infrastructure for electric vehicles as well as its economically viable operation through the development of data-based services.</p>
<p>Cities in Charge</p>  <p>© RWTH Aachen</p>	<p><i>“The overall aim of the consortium is the building of charging infrastructure (CIS) in German metropolitan areas and their surrounding areas. [...] By making these regions more attractive for electric vehicles in terms of accessibility of CIS, the number of these vehicles should be increased, which achieves a contribution to the NO_x-reduction. [...] More specifically, it is planned to build publicly accessible CIS on the Telekom properties within these cities and along the connection to the surrounding areas.”⁷</i></p>
<p>Laden am Arbeitsplatz⁸</p>  <p>© Fraunhofer IAO</p>	<p>The aim is the development of charging infrastructure for electric vehicles on Fraunhofer properties, which can be used by employees, fleets of company cars and third parties.</p>

With one focus on the description of replacement plan of 100% of municipal fleet for electrical vehicles including the integration of the infrastructure in smart grid, MATchUP is an additional module to implement specific measures in order to shape the future

⁵ The Objective of the programme is to achieve a rapid and sustainable improvement in air quality in municipalities where the annual average air quality limit value for nitrogen dioxide is exceeded. The program has a budget of EUR 1.5 billion. (German website: <https://www.bundesregierung.de/breg-de/themen/saubere-luft>)

⁶ For more information see German website: <https://www.dresden.de/de/wirtschaft/wirtschaftsstandort/projekte-kooperationen/smartcity/datentanken.php>

⁷ <http://www.isb.rwth-aachen.de/cms/ISB/Forschung/Projekte/~rexp/Cities-in-Charge/?lidx=1>

⁸ For more information see German website: <https://www.lama.zone/>

vision of Dresden as a smart and innovative city as basis for a sustainable way of living.

LHD will, with the cooperation of DREWAG NETZ GmbH, be responsible for the integration of the charging infrastructure. The effects on the district operation grid are to be investigated. In addition to the optimization of the LIS locations further synergies with the Daten Tanken project (see above), such as the provision of mobility and energy data, in order to be able to switch to the new system via attractive terms of use electric vehicles and to accelerate the dissemination of EMobility are being developed.

Following the LHC Dresden strategy, DREWAG NETZ is expanding the charging infrastructure. 73 semi-public or public charging stations with 136 charging points are currently in the status planning, initiation or technical commissioning. The Dresden vision consists in a total of 277 charging points and 49 electric vehicles were submitted for the further construction of charging infrastructure in Dresden and the region and for the expansion of the fleet of electric vehicles.

- c) Short summary of related MAtchUP actions and how they contribute to the vision

Action 19: e-mobility for public sector: 40 e-vehicles

The activities will help to convert the entire vehicle fleet of the city administration to electric drive within the next six years. DVB will also expand its electric fleet. The use of the vehicles is to be monitored in order to know one day in advance how much electricity will be required. Since all these electric vehicles are to be charged with electricity from renewable sources, this information is essential. The electricity generated locally in the photovoltaic systems of the residential buildings will be used first and foremost. The multidimensional electric remote storage system is of crucial importance for management. The remaining electricity is 100% covered by green electricity. In order to avoid additional load peaks due to simultaneous loading of the vehicles and possibly higher grid connection capacities, the use of a buffer storage must be examined in addition to load management. In addition, the storage tank can be used to synchronise the power supply and demand for the purpose of consuming locally generated electricity.



Action 22: Charging Points and 2 Fast-Charge Stations to improve Charging Infrastructure

First, suitable locations for charging stations in the Smart City district are identified and evaluated. The charging stations will be offered to a wide range of private and professional users. Their capacity depends on the specific requirements of the locations.

Due to the currently low market penetration, the charging stations are often not operated economically by EV. Therefore, owners and operators of car parks are reluctant to set up charging stations. As a remedy, we are initially concentrating on public car parks. This is where we hold preparatory talks with landlords of residential buildings.

Another planned location is a highly frequented shopping centre in Johannstadt. With charging stations at this location, customers can recharge their electric cars both while shopping and at local shops. The increasing density of the charging infrastructure should enable customers of the shopping centre as well as users of semi-public and non-public car parks and underground garages to participate in electric mobility. Work is also underway on the integration of a remote storage system.

Action 40: 5 e-cars for housing sector

It is about electrically powered cars for use in the housing industry. DWG leads and coordinates the activities especially with the cooperation partners VON and FHG. VON builds the necessary charging stations. The e-cars are used by VON for its craftsmen. FHG is responsible for tracking vehicle data and providing derived reports.

Based on the experience gained, mobility concepts for electric vehicles are developed for use in housing companies. These concepts are to be transferred to the partner companies in the sense of all-round services (consisting of electric vehicles, charging infrastructure, energy, authorisation and payment).

Different data are required to evaluate the mobility scenarios. The evaluation is carried out by the FHG. Mobility data can be derived from vehicle on-board units and charging stations. In initial discussions, the mobility data of the vehicles were evaluated. FHG is already informed about the new e-cars. The tracking devices will be installed as soon as VW accepts this.



3 Technical definition of the interventions

3.1 Action 19: E-mobility for public sector: 40 e-vehicles

With the objective of changing into electrical the 100% of the Municipal fleet for 2025 in all its departments (400 vehicles in total), DRE and partners will acquire 40 new e-cars, being all of them fully monitored by the MAtchUP project (data integrated in Dresden Urban Platform). DVB will also increase its electric fleet. The Monitoring of them will be done inside the project. One of the main objectives of monitoring is to predict in advance the expected electric load that will be required in the evening (Action 23), essential information, even more when all of these electric vehicles will be exclusively charged with electricity from renewable energies. In doing so, the locally generated electricity from the photovoltaic systems of the residential buildings is primarily used. For managing this, the Multi-dimensional electric district storage (Action 18) is crucial. The residual current is covered by 100% green electricity. In order to avoid additional load peaks by simultaneous loading of the vehicles and, as the case may be, higher mains connection capacitances, the use of a buffer memory must be checked in addition to a load management. In addition, the memory can be used to synchronize (Action 23) power supply and demand for the purpose of self-consumption of the locally generated current.

An additional economic benefit will be made possible by the optimized storage of electricity through the use of time-variable tariffs (Action 37) and marketing as a system-oriented flexibility (as part of a swarm storage) in the control energy market.

3.2 Action 22: Charging Points and 2 Fast-Charge Stations to improve Charging Infrastructure

To achieve the objectives for mobility in Dresden the LHC's charging infrastructure will be extended by 36 charging points with a charging capacity of 3.6 kW (so-called wall boxes for local residents and traders) and 2 fast charging Stations (from 50 kW). These charging stations will be constructed in Dresden within the framework of the urban mobility points. Due to the spatial consistency, integration into the energy concept will be done through the use of the multi-dimensional electric district storage (Action 18). These charging stations can be booked by the users (Action 23) and their behavior will be monitored (Action 11) for managing the electric mobility (Action 24) using the Urban Platform as communication network (Action 67).

3.3 Action 40: 5 e-cars for housing sector

The housing sector employs various technical and non-technical staff (housekeeper, real estate agents, service employees and craftsmen). Their mobility scenarios differ from each other but most of them take place in a rural area. Headquarters and service centers are located very close to their apartment buildings. Nonetheless these might be



excellent use cases for electric mobility. At this point there are very few or none electric vehicles in use. To change this insufficient status the project will put into operation 5 new electric vehicles for monitoring their mobility behaviour through a data platform. This marks the starting point for a complete electrification studying the derivation of full-service- solutions with direct involvement of housing companies. By analysing needs and application scenarios, mobility concepts for electric vehicles are developed for the use cases of housing companies. Based on these concepts, suitable mobility services, as defined by full services (consisting of electric vehicles, charging infrastructure, energy, authorization and payment), are created and implemented prototypically at the partner companies.



4 Executive project description of each action

4.1 Action 19: E-mobility for public sector: 40 e-vehicles

4.1.1 Management structure

The action is led by FHG, dept. for Energy Storage Systems, with contributions from DWG and DVB.

4.1.2 Technical specification

The vehicles acquired by the partners will be equipped with a monitoring and telematics platform developed by FHG; besides commercially available telematics devices, which will be programmed by FHG to transmit locally acquired data incl. position data to a Cloud-Service. The latter will also be developed by FHG. Care will be taken to take existing data privacy considerations into account.

The next image depicts a work flow from the source to the final web platform. The platform will be able to accept data from a multitude of up to 100 vehicles at a time, and to display the information in an adaptable and customizable form in a web interface. Basic analysis and KPI generation will be easily implementable.

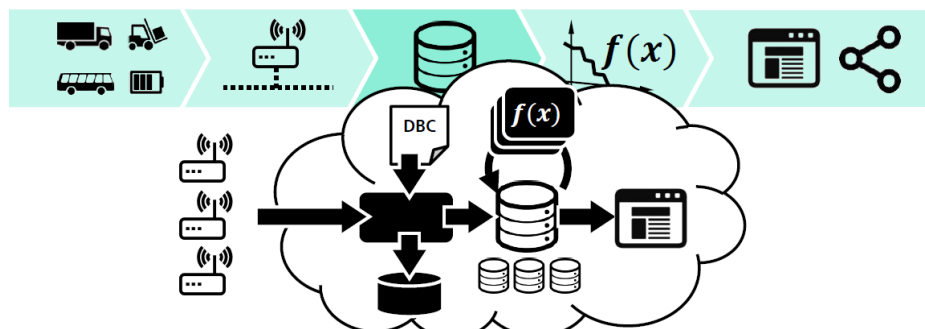


Figure 2: Schematics of the telematics activity

4.1.3 Planning of the tasks

Year 1				Year 2				Year 3	Year 4	Year 5
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8			
(1)	(1)									
	(2)	(2)	(2)	(2)	(2)					
					(3)	(3)				
						(4)				
						(5)	(5)	(5)	(5)	(5)

Figure 3: Gantt chart of Action 19

- (1) Design phase
- (2) Selection of equipment and installers
- (3) Installation of hard-/software
- (4) Start of operation
- (5) Monitoring

4.1.4 Health, safety and waste management requirements

None (software topic).

4.1.5 Risks considered ex-ante and proposed risk-mitigation measures

The availability of the necessary cooperation was considered before and may well pose a risk.

4.2 Action 22: Charging Points and 2 Fast-Charge Stations to improve Charging Infrastructure

4.2.1 Management structure

Project led by business development within DWG.

Individual project A22 has been realized by the competency team Electric Mobility at DREWAG NETZ/ ENSO NETZ including acquisition of the partners, project planning, construction and operation.

DRE accompanies the authorization process of charging points in the LHC of Dresden.



4.2.2 Technical specification

Technical specification for VON: Charging infrastructure, power supply via public grid, back-end integration.

Charging Infrastructure

- 2 Charging stations from EBG Compleo Highline
- Each with 2 charging points with 22 kW,
- Each Connector with EU-wide Typ2 – Standard According to the newest German Metering Standard

Power supply

- Standard 30 kW power supply from public grid and local load management for the 2 charging stations

Backend

- Each Charge point is integrated via OCPP 1.6 in a E-Mobility-Backend
- Dynamic Status Data (free/occupied)

4.2.3 Planning of the tasks

Year 1				Year 2				Year 3	Year 4	Year 5
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8			
(1)	(1)									
		(2)	(2)							
					(3)	(3)	(3)			
						(4)	(4)			
								(5)	(5)	(5)

Figure 4: Gantt chart of Action 22

- (1) Design phase
- (2) Selection of equipment and installers
- (3) Installation of hard-/software
- (4) Start of operation
- (5) Monitoring

4.2.4 Health, safety and waste management requirements

Not applicable.



4.2.5 Risks considered ex-ante and proposed risk-mitigation measures

Due to a currently low market penetration of EV's charging points cannot be operated in an economically way. Thus, owners and operators of parking area hesitate to build up charging points. As mitigation measures we first concentrate on developing public parking spaces.

4.3 Action 40: 5 e-cars for housing sector

4.3.1 Management structure

Action 40 is led and coordinated by DWG. For the implementation, the following departments work together: Sales, marketing, business customers.

VON will be responsible for coordinating the construction of the charging stations. The electric cars will be used by VON for their craftsmen.

FHG is in charge of tracking the data of the car usage and of providing derived reports.

4.3.2 Technical specification

Technical specification for VON: Charging infrastructure with two intelligent charging stations at Pfothenhauer Straße and the use of 3 e-Golfs for VON craftsmen is provided. These charging stations with four charging points with 22 kW output power each and RFID as authentication option are ideal for charging vehicle fleets in public areas or in semi-public car parks. This build-up of electric car fleet and its charging infrastructure is done to enlarge supply and use of electromobility not only in the Smart City district but also in all the City of Dresden.



4.3.3 Planning of the tasks

Year 1				Year 2				Year 3	Year 4	Year 5
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8			
			(1)	(1)						
				(2)	(2)					
					(3)	(3)				
						(4)				
						(5)	(5)	(5)	(5)	(5)
						M1	M2			

Figure 5: Gantt chart of Action 40

- (1) Design phase
- (2) Selection of equipment and installers
- (3) Installation of hard-/software
- (4) Start of operation
- (5) Monitoring

Milestones:

- (M1) Development vehicle booking system
- (M2) Drawing up contracts for the rental of electric cars to VONOVIA tenants

4.3.4 Health, safety and waste management requirements

Not applicable.

4.3.5 Risks considered ex-ante and proposed risk-mitigation measures

Several issues concerning security of private data concerning mobility data were identified. Required data from planned onboard-units have to be redefined by FHG and to be approved by VON.

Due to the high data protection guidelines of German car manufacturer VW, the project expenditure might be increased and affect the timeline for monitoring.

Economic feasibility of e-Car sharing to tenants is still under examination and might cause delays in the project. DWG went into a discussion process with VON and DVB to find solutions for this issue.



5 Status of the intervention

5.1 Action 19: E-mobility for public sector: 40 e-vehicles

5.1.1 Status of the intervention

Progress done from D3.1 Action Card (M12): The action deals with the following major points:

- requirement specification for vehicle monitoring is finished
- definition of business relevant parameters, e.g. battery parameters state of charge, voltage, current, power and driving parameters e.g. position, velocity, stops has been performed
- development, implementation and test of a prototypic data interface in 2 BMW i3 have been implemented
- setup of a secure data transmission channel has been performed
- a web based user and data interface has been set up
- screening of potential business customers is ongoing



Figure 6: Chosen telematics devices (STW TC3G)

Next milestones:

- installation of 3 devices into 3 VW eGolf of VON (4Q 2019)
- gathering of the data conversion tables from the car manufacturers
- monitoring of the fleet, supporting partners in data evaluation, and evaluating the data with regard to the KPIs

5.1.2 Risks found and corrective actions performed

The cooperation of the car manufacturers in data sharing.

5.1.3 Business model and financial scheme applied

FHG: For this action, a budget of 12 PM (154,700€, thereof 7,200€ company cofinancing) is designated. Additionally, 30,000€ invest budget for telemetry device and 10,000€ test hardware procurement have been granted (each 100% of depreciation costs.)

DWG: For this action the total DWG-budget amounts to 18,000 €. 12,600 € of this amount will be financed by MAtchUP funds, the rest of 5,400 € will be funded by DWG.

- 14,400 € for equipment. 14,400 € depreciation of 3 Battery storages for charging stations (total cost: 24 k€ - duration: 5 yr – use in the project 3 yr – depreciation ratio: 60%).
- 3,600 € indirect costs declared on the basis of the flat-rate of 25% of the eligible direct costs (=0,25 x 14,400€).

DRE: 600,000€ municipal funds.

DVB: 907,775 € total invest, thereof 832,332.50 € company cofinancing was granted. Additionally, 4 monitoring telematics box of e-buses (eligible budget: 20,000 €) were granted.

5.1.4 Citizen engagement strategy implemented

No particular participation anticipated.

5.2 Action 22: Charging Points and 2 Fast-Charge Stations to improve Charging Infrastructure

5.2.1 Status of the intervention

Progress done from D3.1 Action Card (M12):

In the first step, we analysed and identified suitable locations for charging points in the district Johannstadt.

The original idea of setting up all charging points with a focus on VON tenants had to be extended to a broader range of users. The use of private EV's of tenants of VON-buildings is still quite low and the MAtchUP-partners agreed to enable the maximum of residents and business clients in the district to charge. For this reason our focus was set on highly frequented charging locations. The capacity of the charging stations is aligned to the specific requirements of the locations. These private charging points constitute a useful addition to the planned mobility points of Dresden which cover different mobility scenarios.

We concentrated on semi-public and non-public car parking spaces and subterranean garages. We are expecting to enable local residents and local businesses to charge electric cars.



For that, we've been primarily contacting several landlords of residential buildings in terms of pre-contract negotiations. Another location is the shopping centre SP1 at Straßburger Platz in Dresden (www.sp1-dresden.de). Charging stations at this site would allow to charge employees and local business as well as customers electric cars while shopping. Corresponding negotiations are under way.

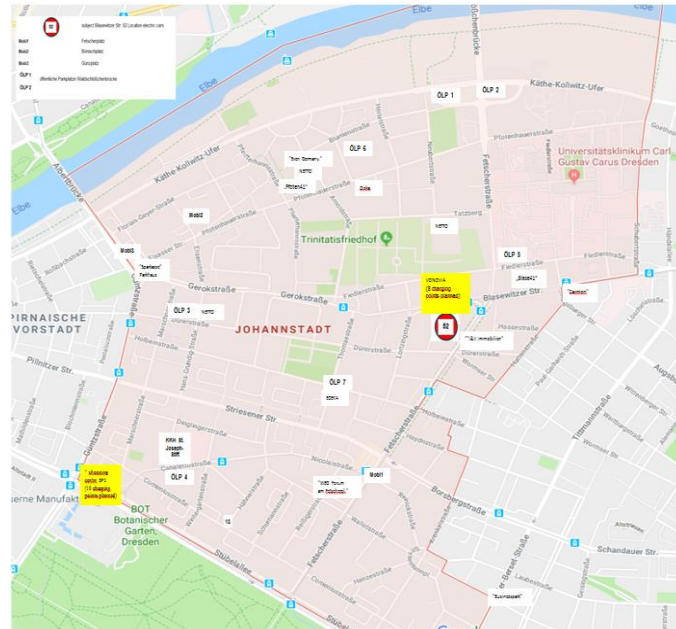


Figure 7: Map of charging stations

Name of charging point	street address	Number of charging stations	Number of charging points
"Dietz"	Straßburger Pl. 1	5	10
VONOVIA (Location electric cars)	Blasewitzer Str. 52	3	6
"Businesspark"	Berthold-Brecht-Allee 22	under discussion	
"Caverion"	Blasewitzer Str. 80	under discussion	
"I&V Immobilien / Betr. / Verm. Ges."	Fetscherstr. 62	under discussion	
"WEG Forum am Fetscherpl."	Fetscherstr. 23	no need for charging stations	
"Argentaurus"	Schandauer Str. 34	under discussion	
"Even Germany"	Gutenbergstr. 5	under discussion	
"KSD" Neubau	Schandauer Str. 28	under discussion	
"WEG Schandauer Str."	Schandauer Str. 23 b	under discussion	
ADAC	Striesener Straße 37	under discussion	
"Sparkasse Parkhaus"	Günzplatz 5	no need for charging stations	

Figure 8: List of charging stations

All our approaches for semi-public and non-public charging infrastructure had to be cancelled. We keep on track with VON with 3 EV's for the Pfotenhauer street parking space for employees to be equipped with 4 charging points of 22 kW.

Public parking space Waldschlösschenbrücke (WSB): In conversation with DRE addition to the mobility concept about 20 charging points, project sketch created.

Mobility point Fetscherplatz: 6 fast charging points of 150 kW each, execution planning completed, construction in Q3 2019, stationary storage ordered, realization/ financing in cooperation with project "Data Tanken".



Milestones from M12:

- Q4/ 2018: Preparation of an offer for the construction of charging points in the shopping center
- Q1/ 2019: Further search for suitable locations
- Q1/ 2019: Extension of the search for charging points in the public area
- Q2/ 2019: Connection to platform — smart management for electric mobility (Action A24)

5.2.2 Risks found and corrective actions performed

As described in Action A 18 from Deliverable 3.5 there were several changes for integration of a district storage system. Depending on the approval of the 2nd Amendment we will carry out an appropriate approach.

5.2.3 Business model and financial scheme applied

For this action the total DWG-budget amounts to 27,862.50 €. 19,503.75 € of this amount will be financed by MAtchUP funds, the rest of 8,358.75 € will be funded by DWG and ENSNTZ.

- 19,890 € for 3 employees pro rata temporis over three years. After the end of the MAtchUP-project in 2022 the employees will work for ENSNTZ in other projects.
- 2,400 € for equipment. 2,400 € depreciation of 2 monitoring equipment for the 50 kW charging infrastructure (total cost: 2.4 k€ - duration: 3 yr – use in the project 3 yr – depreciation ratio: 100%).
- 5,572.50 € indirect costs declared on the basis of the flat-rate of 25% of the eligible direct costs (=0.25 x (19,890€+2,400€)).

In the case of the approval of the 2nd amendment the financial scheme will change in the following way:

For this action a total DWG- budget is 69,300 €. 48,510 € of this amount will be financed by MAtchUP funds, the rest of 20,790 € will be funded by DWG and ENSNTZ.

- 53,040 € for 3 employees pro rata temporis over three years. After the end of the MAtchUP-project in 2022 the employees will work for ENSNTZ in other projects.
- 2,400 € for equipment. 2,400 € depreciation of 2 monitoring equipment for the 50 kW charging infrastructure (total cost: 2.4 k€ - duration: 3 yr – use in the project 3 yr – depreciation ratio: 100%).
- 13,860 € indirect costs declared on the basis of the flat-rate of 25% of the eligible direct costs (=0.25 x (53,040€+2,400€)).

5.2.4 Citizen engagement strategy implemented

The ongoing densification of the charging infrastructure aims to enable customers of the shopping centre and users of semi-public and non-public car parks and underground garages to participate in electromobility.

This action will enable tenants to charge an electric car at home (in their own district).



5.3 Action 40: 5 e-cars for housing sector

5.3.1 Status of the intervention

With our project partner VONOVIA SE we are planning to use electric vehicles within the MAtchUP-project. The electric vehicles will replace the VW Golfs with conventional internal combustion engines currently in use.

For this reason DWG ordered 5 VW e-Golfs which should be provided to VON. The underlying vehicle rental contract DWG ./ VON has been drawn up and negotiated.

Progress done from D3.1 Action Card (M12):

For the construction of the charging infrastructure, the offer and planning are signed by VON. It is recorded in the contract that the construction will start as soon as the e-Golfs are handed over to the craftsmen of VON. The final charging infrastructure is available since August 2019.

As the craftsmen of VON have their working places at the Pfothenhauer Straße (2km from Blasewitzer Straße) it was planned to have two new charging points (at Blasewitzer- and Pfothenhauer Straße) instead of only one at Blasewitzer Straße. The first site at Pfothenhauer Straße should be provided for the 3 e-Golfs and the second site at Blasewitzer Straße should be provided for the car sharing service. Initially it was planned that all 5 e-cars should be charged with photovoltaic and used by carsharing with special conditions of the tenants of the “smart tenant house” at Blasewitzer Straße. Furthermore, it was planned that VON will provide 3 e-Golfs (ordered by DWG), which will be used by their craftsmen, and 2 e-Golfs will be provided by a carsharing service and used by tenants. The current situation is that in the LHC-district of Johannstadt a densification of public charging infrastructure currently is taking place. Within the duration of the MAtchUP-project, various decisions concerning the mobility hubs of our MAtchUP-partner DVB (lead) and DWG (responsible for the charging points) were taken. As one result, there will be two new mobility hubs near to the apartment building Blasewitzer Str. 36, the MOBipoints Fetscherplatz and Bönischplatz, all equipped with eCars and operated by a eCarsharing-provider. Thus, tenants of Blasewitzer Str. 36 will be able to access to a mobility hub within walking distance to use a shared eCar.

The MAtchUP-partners DVB, VON, DWG are convinced that the mobility hub concept (called MOBipunkt) will become preferable for the tenants of Blasewitzer Str. as this is an intersection for different mobility routes. Thus, the new approach DWG and VON will incentivise tenants to use these public cars instead of providing two designated eCars for just one apartment building by DWG.

DVB is leading the intermodal mobility hubs and interacting with the eCarsharing operator. Therefore DWG is going to transfer budget positions which were initially planned to develop an own DWG-eCarsharing-system. We assume this new approach as more consumer-orientated and advantageous economically for all partners involved. As customers of DVB have special conditions for using carsharing, the usage of the electrical cars of the carsharing provider might be higher than in the originally planned action. The inclusion of DVB therefore helps to achieve the goals of the action. Further tariff products might be developed between the partners for simplifying the access to the mobility services.



The future multimodal mobility planning application in responsibility of DVB (see action 66) may have a significant influence to change the personnel mobility behaviour of the tenants of Blasewitzer Str. 36 due to using different mobility offers more easily and optimizing alternative transport routes.



Figure 9: Take-over of 3 eGolfs by VON-staff

Earlier as expected, the 3 e-Golfs were handed over on 29 May 2019 after 4 vehicles (Corsa Gasoline) of VON were destroyed by arson on 19 May 2019. Resulting, currently there were no charging possibilities at the parking lot of VON. As a temporary interim solution, the e-Golfs were charged on public charging stations. Finally on 26 August two charging stations at Pfortenhauer Straße were provided for the craftsmen of VON.



Figure 10: VON vehicles destroyed by fire attack

For the two electric vehicles provided by a carsharing service, the realization of different options is under discussion. This may result in a decision to cancel e-carsharing activities for tenants if there cannot be found a course towards an economic value added.

Table 6: Assessment of carsharing service providers

Carsharing service provider	Assessment
Deutsche Bahn Connect GmbH	The Deutsche Bahn Connect GmbH provides the hard-/software for the reservation and billing system for Flinkster and TeilAuto. We can also use these two components. Advantage: <ul style="list-style-type: none"> - use of existing hard-/Software (app) - own client with subclients - we could set up and charge our own prices - opening the platform to other users outside MAtchUP project - use for carsharing community Disadvantage: <ul style="list-style-type: none"> - Very high implementation and usage fees - manual care of the system
TeilAuto	<ul style="list-style-type: none"> - Label "TeilAuto" and not VON possible - Charging station at Bönischplatz (far away) - Profitability gap was indicated, funding requested by DWG Project risk: Lack of demand from electric cars in car sharing; Economic operation extremely difficult to implement
Flinkster (VON partner)	Flinkster opposes the provision of electric cars for economic reasons.

To evaluate the mobility scenarios different data is needed. The evaluation will be done by FHG. Mobility data can be derived from the cars' onboard-unit and charging stations. Initial discussions were held to evaluate the mobility data of the vehicles. FHG is already informed about the new electric vehicles. The tracking devices will be installed as soon as VW accept this.

Next Milestones:

- Two new mobility hubs near to the apartment building Blasewitzer Str. 36 (MOBIpoints Fetscherplatz and Bönischplatz)
- The MOBIpoints will be equipped with eCars and operated by a eCarsharing-provider
- The tenants of Blasewitzer Str. 36 will be able to access to a mobility hub within walking distance to use a shared eCar

To evaluate the mobility scenarios different data is needed. The evaluation is currently realized by FHG. Mobility data can be derived from the cars' onboard-unit and charging stations. Initial discussions were held to evaluate the mobility data of the vehicles. FHG is already informed about the new electric vehicles. The tracking devices will be installed as soon as VW accept this.

5.3.2 Risks found and corrective actions performed

4 vehicles (Corsa Gasoline) were destroyed by arson on 19 May 2019. The new electric cars needed to be provided earlier as well as the charging stations.

Currently the cars are already provided to VON, but the charging stations are not constructed. The interim solution is to use public charging points.



5.3.3 Business model and financial scheme applied

For this action the total DWG-budget amounts to 65,350 €. 45,745 € of this amount will be financed by MAtchUP funds, the rest of 19,605 € will be funded by DWG and ENSACH.

- 39,780 € for 2 employees pro rata temporis over three years. After the end of the MAtchUP-project in 2022 the employees will work for ENSACH in other projects.
- 12,500 € for equipment. 7,500 € depreciation of 5 monitoring equipment (total cost: 7.5 k€ - duration: 3 yr – use in the project 3 yr – depreciation ratio: 100%) and 5,000 € depreciation of 1 test-hardware (total cost: 5 k€ - duration: 3 yr – use in the project 3 yr – depreciation ratio: 100%).
- 13,070 € indirect costs declared on the basis of the flat-rate of 25% of the eligible direct costs ($=0.25 \times (39,780\text{€}+12,500\text{€})$).

In the case of the approval of the 2nd amendment the financial scheme will change in the following way:

For this action a total DWG- budget is 106,787.50 €. 74,751.25 € of this amount will be financed by MAtchUP funds, the rest of 32,036.25 € will be funded by DWG and ENSACH.

- 72,930 € for 2 employees pro rata temporis over three years. After the end of the MAtchUP-project in 2022 the employees will work for ENSACH in other projects.
- 12,500 € for equipment. 7,500 € depreciation of 5 monitoring equipment (total cost: 7.5 k€ - duration: 3 yr – use in the project 3 yr – depreciation ratio: 100%) and 5,000 € depreciation of 1 test-hardware (total cost: 5 k€ - duration: 3 yr – use in the project 3 yr – depreciation ratio: 100%).
- 21,357.50 € indirect costs declared on the basis of the flat-rate of 25% of the eligible direct costs ($=0.25 \times (72,930\text{€}+12,500\text{€})$).

5.3.4 Citizen engagement strategy implemented

Within this action, tenants of VON are enabled to use the electric cars.

5.4 Next steps

A cooperation of DVB and the eCarsharing operator at the intermodal mobility hubs (MOBIpoints) at Fetscherplatz and Bönischplatz became the preferable solution for e-carsharing activities for tenants. Therefore following next steps are required until December 2019:

- Definition of the interacting of DVB and the eCarsharing operator at intermodal mobility hubs
- Development of special conditions for using carsharing for customers of DVB
- Development of further tariff products for simplifying the access to the mobility services between the partners



6 Conclusions

This deliverable aims at giving a broad overview on the changing of the municipal fleet into electrical energy by 100% for 2025 in all its departments (400 vehicles in total). The combined actions were carried out through a strong cooperation between MATCHUP partners DWG, VON and DRE from various branches and with different competences.

Altogether, partners are making good progress by acquiring new electric cars as well as the deployment of charging points for electric cars and buses (details in chapter 5).

It is this variety of partners that makes it possible to connect energetic supply, technological charging technology with availability of central places as well as administrative power. Thus, once realised the outcome of this task will lead to an innovative and ecological contribution to the reduction of traffic related emissions as a result of the H2020-project.

Use of private electric cars owned by VON tenants is still low. Thus, it was decided to allow the use of charging stations for their EVs by all residents and business clients in the district. Therefore, focus was set on highly frequented charging locations. The capacity of the charging stations is aligned to the specific requirements of the locations. All planned activities for semi-public and non-public charging infrastructure had to be cancelled. DWG, VON and DRE concentrated on semi-public and non-public car parking spaces and subterranean garages. The partners expect to enable further local residents and local business to charge electric cars.

All involved actions will be monitored and documented, involving the successes as well as the emerging problems and failures that might come up. This monitoring should end up in a general strategy on how future projects on fleet changes towards electrification should be managed and realised. Furthermore this strategy should take into account what risks and challenges can emerge in similar projects.

