



# Step by step to your electric bus fleet

Whitepaper: Guideline for successfully introducing e-buses

# Introduction

## Bus fleets in transition

Transitioning to electric vehicles in the area of local public transport (PT) is no longer just an option, but an urgently needed measure to achieve environmental targets. Bus fleets in particular have enormous potential to reduce emissions and improve the quality of life in our cities and, as a result, have become the focus of electrification. This represents both a great opportunity and a challenge for transport companies. On the one hand, there is the opportunity to switch to a more efficient and climate-friendly means of public transport and to future-proof the fleet. On the other hand, the implementation and operation of electric buses places new demands on the infrastructure and operational processes within the transport company.

## Managing electromobility

The promise of electromobility is tempting: lower emissions, improved driving characteristics, and ease of maintenance that puts combustion engines in the shade. The challenge, however, is to successfully master the transition to electromobility. A key role in this is played by a central, intelligent charging management system, which is crucial for efficient and cost-optimized operation. With this whitepaper, we would like to support you in mastering this task. It provides you with valuable arguments for the switch to electromobility, and shows the steps involved in the transition. It also explains how intelligent charge management works: it helps you to build your e-bus fleet, use it efficiently, and make your bus operations fit for the making the most of electromobility. We will also briefly introduce CarMedialab GmbH.



Electric buses are not only the future of public transport – they are the future of mobility in cities." CarMedialab

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# 1 Reasons for making the switch to e-mobility

The mobility industry is in constant motion. The transformation to electromobility and greener transportation is currently the most important trend in the global transportation landscape. Specifically in the bus industry, there are several trends that can influence your decision when it comes to switching to an electric bus fleet. It is time to actively shape this journey and take advantage of the numerous opportunities that electric mobility offers.

## Reducing greenhouse gas emissions

Governments around the world are increasingly focusing on decarbonization, driving the electrification of bus fleets. Electric buses are seen as a critical means of reducing greenhouse gas emissions and improving air quality in urban areas. In addition, increasingly stringent emissions standards and environmental regulations are increasing the demands on bus fleets. For example, the [Clean Vehicles Directive](#) requires transit agencies to procure vehicles with low and zero-emission engines.



## Use of funding

To accelerate the move to electric mobility, many countries are relying on financial incentives and support programs. These range from direct support for the purchase of electric buses to subsidies for expanding charging infrastructure. In Germany, the Federal Ministry for Digital Affairs and Transport provides an investment grant to transport opera-



tors. Find out about the funding programs in your region or country. For more information on funding opportunities in Germany see <https://bmdv.bund.de>.

## Users' expectations are growing

People are becoming increasingly environmentally aware and expect their cities and local transportation companies to provide clean, green and sustainable mobility solutions. This trend puts increasing pressure on transport companies to electrify their fleets and reduce their carbon footprint. In Germany, around 20 % of the CO<sub>2</sub> footprint per capita can be attributed to mobility.

## Application of innovations

Electric bus technology is improving all the time; better battery technology is leading to longer ranges, shorter charging times and longer battery life. In addition, new technologies are enabling more intelligent control of charging processes, further improving the efficiency and cost-effectiveness of electric bus operations.

Increasingly, transit agencies are recognizing the need to think beyond the bus on its own and to consider the complex system of bus fleet, charging infrastructure and energy management. Innovative solutions such as intelligent charging software are being used to increase efficiency, reduce costs and ensure grid stability.

## 2 Steps in the transition to e-mobility

The transition to an electric bus fleet is a complex task that requires thorough preparation and planning. The following points should be considered when introducing electric buses.

### Proper selection of hardware and software:

#### Hardware

- Electric buses and technologies, vehicle types, battery technologies
- Compatible charging stations: both for your depot and for charging stations on the route, and appropriate chargers (plug-in or pantograph)

#### Software

- Independent energy and charge management

The interaction between high-quality hardware and carefully selected, powerful software is the be-all and end-all of a successful introduction of e-buses. In the following, we would like to show you what aspects you need to consider.

### Start with strategic planning:

Goal definition: define clear goals for the electrification of your fleet. How many buses should be con-

verted to electric drive and when? How much CO<sub>2</sub> are you hoping to save?

Financial planning: Clarify the financial aspects of the conversion. Consider not only the initial cost of the buses, but also the cost of charging infrastructure and energy management.

### Select buses and technology:

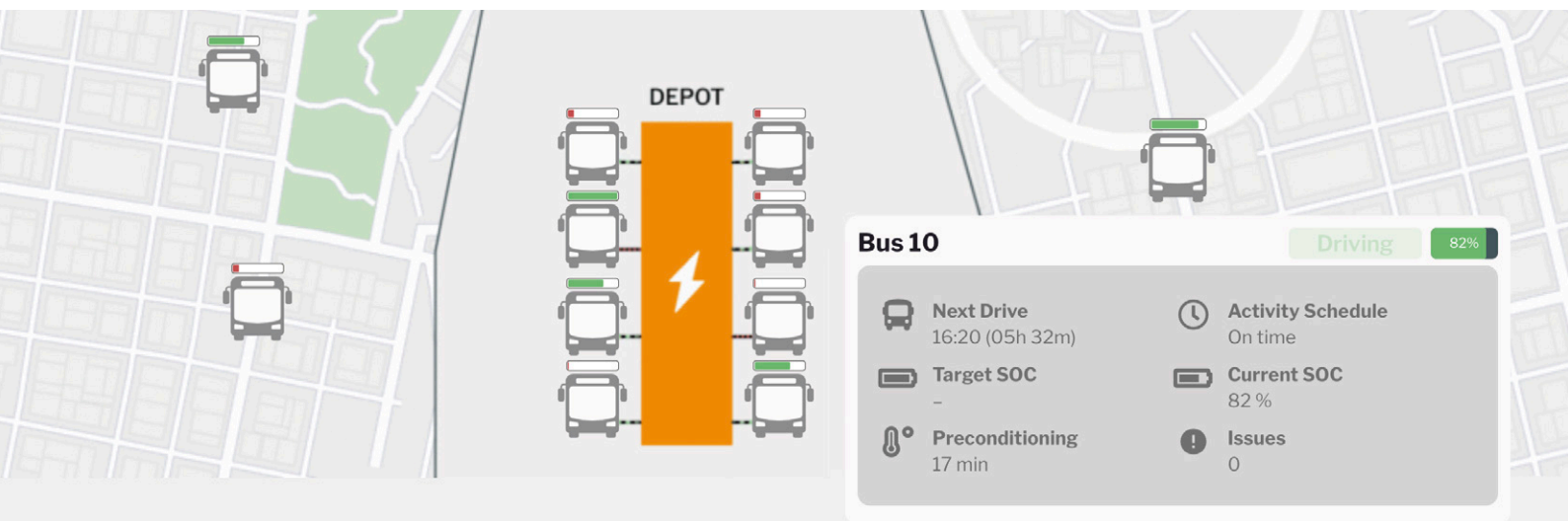
Vehicle types: Select the appropriate vehicle types. Consider factors such as capacity, range, and charging requirements.

Technology evaluation: evaluate the available technologies. Which battery technology is best suited for your needs?

### What charging infrastructure is needed?

Charging infrastructure: Plan the installation of the charging infrastructure. Where should the charging stations be installed? How many charging points are needed?

Charge management: Ensure efficient energy management. How can charging be optimally controlled



New task for the bus operators: monitoring the e-buses



to avoid peak loads? Use good software to simplify processes.

### **Operating procedures and training**

Adapt operating procedures: Adapt your operating procedures to the new requirements. When and where can buses be charged? How can downtime be minimized?

Train staff: make sure your staff is trained to handle electric buses.

### **Take advantage of funding opportunities and partnerships**

Funding programs: Find out about possible grant programs for purchasing electric buses and building the charging infrastructure.

Partnerships: seek partnerships with utilities suppliers, technology providers, and other stakeholders to benefit from synergies and facilitate the transition.

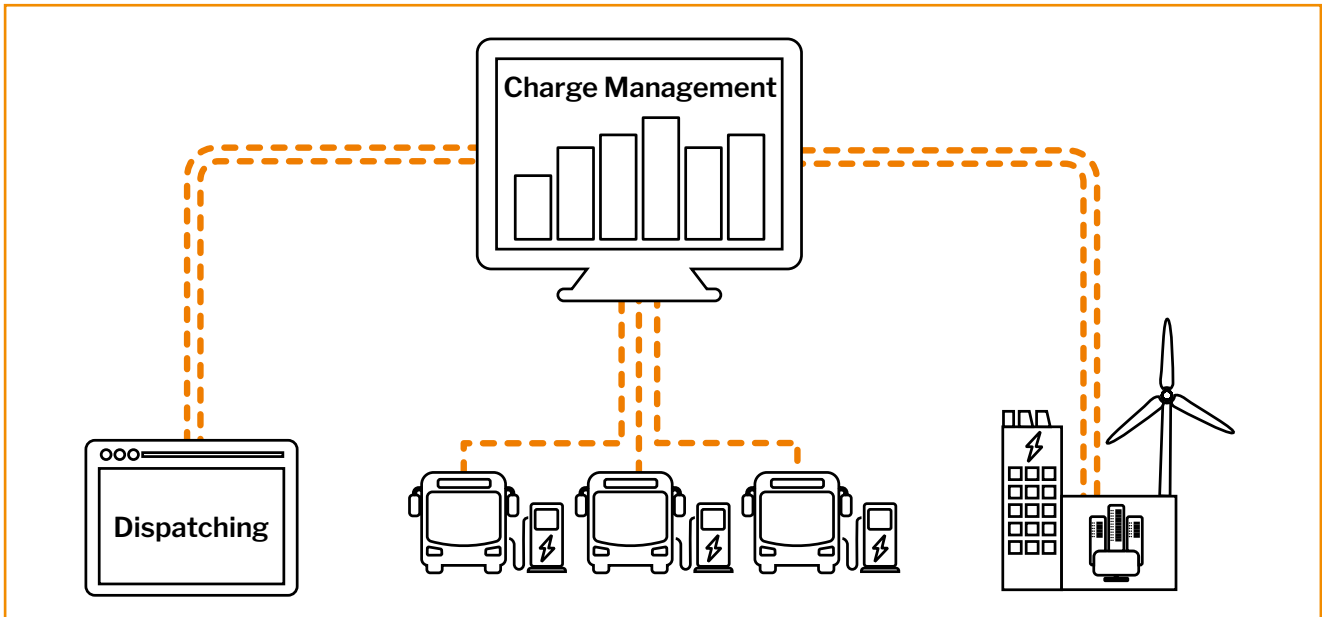
Converting to an electric bus fleet is a challenge, but also a great opportunity.

With the right planning and preparation, you can master it successfully and reap the benefits of electric mobility for your business.

For more information on additional applications and helpful tips, click here: [www.carmedialab.com/en/public-transport/overview/](http://www.carmedialab.com/en/public-transport/overview/)



### 3 Charging e-buses intelligently



How intelligent charge management works

The introduction of intelligent charge management brings numerous benefits beyond the simple charging of electric buses. Here are the key benefits that controlled charging offers your business:



#### Increased efficiency

A dynamic charging system optimizes the charging processes of your electric buses, thus ensuring maximum readiness and operational efficiency of your fleet. This way, you can know that your buses are always ready when they are needed. Choose and test this system for yourself, as it can significantly simplify your day-to-day operations.



#### Cost savings

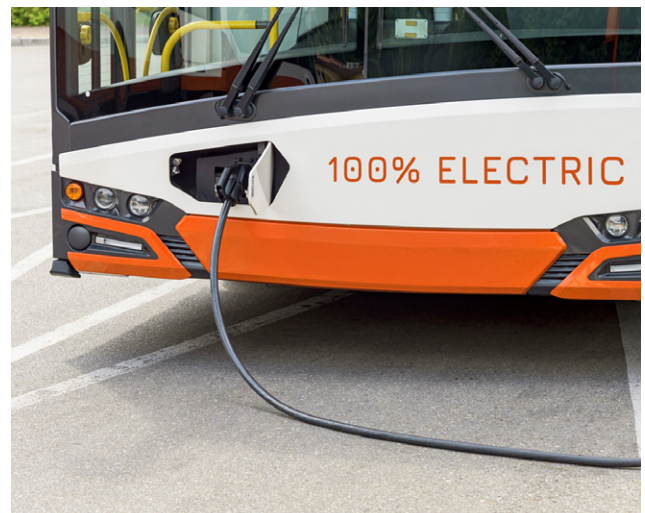
Thanks to intelligent control of charging processes and so-called "peak shaving", you can significantly reduce the cost of electricity and the load on the grid. In addition, good energy and charge management can help extend the life of batteries and

charging infrastructure, resulting in further cost savings.

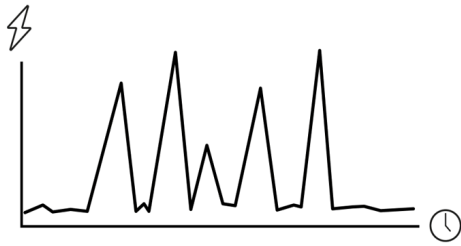


#### Preventing grid shortages

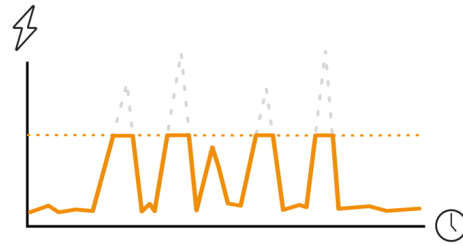
A key success factor when implementing e-buses in a fleet is the efficient use of the available electricity capacity. Here again, peak shaving and load shifting play a central role.



### Charging without MOBILEcharge



### Charging with MOBILEcharge



Peak load reduction through peak shaving

Peak shaving refers to the smoothing of peak loads in electricity consumption in order to reduce the maximum load on the power grid. This is particularly important because the cost of electricity is calculated not only according to consumption, but also according to maximum power consumption, known as peak loads. Increased peak consumption can therefore lead to significant cost increases. When operating an electric bus fleet these peak loads occur especially when many buses are charged at the same time, for example during breaks in operation overnight. An intelligent charge management system can smooth out these peaks. It controls the charging process of the buses to make optimal use of available power and avoid peak loads. You can achieve a reduction in peak loads and save up to 70 % on costs. Peak shaving not only reduces the cost of electricity, but also extends the service life of the charging infrastructure. It also helps to re-

lieve the load on the power grid and thus prevent grid bottlenecks and outages. Efficient peak load optimization requires precise planning and a deep understanding of operations. Precise knowledge of driving times and breaks, vehicle ranges, and the capacity and performance of the charging infrastructure are crucial.



### Sustainability

With a good management system, you can reduce the energy consumption of your bus fleet and thus make an important contribution to reducing CO<sub>2</sub> emissions and protecting the climate. By using electricity from renewable energy sources, the greenhouse gas emissions of local buses could be almost completely eliminated. In addition, the use of electric buses leads to an improvement in air quality and a reduction in overall noise pollution.







### Transparency and monitoring

Detailed monitoring and reporting by the charge management system gives you a comprehensive overview of the status of your buses at all times. This allows you to continuously monitor and optimize your operations.



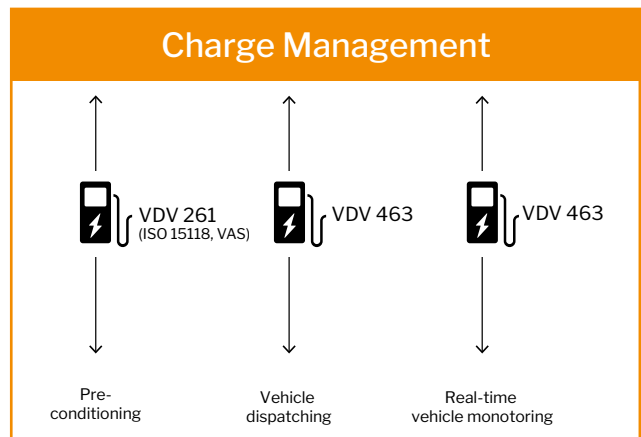
### Flexibility and scalability

To be able to coordinate your e-bus fleet optimally, your systems must be in synch with each other. This is where integrated standard interfaces help with data exchange. A charge management system with the right interfaces can easily be integrated into your existing systems and processes and adapted to changing conditions and requirements. The system is always ready to grow with your fleet and your business. More information on the topic of interoperability in e-mobility projects can be found in our whitepaper "[Standard interfaces for charging e-buses – Interoperability in data exchange for Charge Management](#)".



### Safety

An intelligent system ensures safe and reliable operation of your charging infrastructure. The charging software continuously monitors the condition of the batteries in your fleet's e-buses and the charging points and can issue automatic warnings in case of emergency. With the introduction of a charge management system, you invest in securing the future of your business and contribute to improving efficiency and sustainability.



Scalability through data communication standards



## 4 About CarMedialab



### **CarMedialab is a technology leader**

Our product spectrum ranges from software and systems for use in vehicles and charging stations, to solutions for sustainable local public transport. 20 years of expertise as well as countless completed projects worldwide speak for our high level of competence. With products such as the "MOBILEcharge" charge management system, we have proven that we can offer innovative and future-proof solutions for electromobility. Our goal is to help our customers fully exploit the benefits of electromobility and successfully prepare their vehicle fleets for the future.

### **The solution for charging your fleet**

MOBILEcharge provides intelligent charging processes that take into account operational data, variable electricity tariffs, energy storage and vehicle data. This allows you to efficiently plan your charging operations and optimize electricity costs. Centralized charge management enables optimal monitoring and control during operation and charging of all electric buses. Parallel, controlled and automated charging processes ensure that your buses are charged quickly and efficiently without overloading the power supply. MOBILEcharge conserves your battery by balancing the total power load, thus helping you to prolong the life of your

batteries. Our solution uses industry standards such as OCPP (Open Charge Point Protocol), ISO 15118 VAS (Value Added Services), VDV 463 and VDV 261, and VDV 261, so you can be sure you're getting a future-proof and compatible solution. With active diagnostics and remote control of charging points and transformers, you always have full control over your e-bus fleet. Problems can be detected and rectified at an early stage. Downtimes are minimized. As a trusted provider, we guarantee you independent and secure data. Our many years of experience in data collection ensure the security of your information. With MOBILEcharge you also gain valuable insights into your depots and energy supply. Predictions help you to plan your resources efficiently. Real-time data enables you to make informed decisions. The system can be seamlessly integrated into your existing application landscape, whether ITCS, depot management system or your energy supplier.



### MOBILEcharge in use

Our charge management system has already helped numerous companies around the world successfully make the transition to electromobility and embrace progress. A wide variety of new projects – among others in Brussels, Dakar, Israel and Vancouver – are already in the pipeline.

We are proud to be able to support these and many other transport companies on their path to electromobility. We look forward to supporting you in your transition as well. Feel free to contact us to learn more, how CarMedialab and MOBILEcharge can help you to achieve your electromobility and sustainability goals. We are also happy to answer any other questions you may have.

For more information, please visit:

[www.carmedialab.com](http://www.carmedialab.com)



**MOBILEcharge will help us to provide a maximum number of buses on time [...] Let the electromobility revolution begin!**

**Shirley W.,**  
Product Manager,  
Ayalon Highways, Israel



Tide has optimized the charging infrastructure in Bergen, Norway with MOBILEcharge. In total, the system has been integrated into 52 charging stations and 112 electric buses have been efficiently charging there since 2020.



Leipziger Verkehrsbetriebe already operates four bus routes with the help of electric buses, actively supporting the city's energy goals. A total of 56 charging stations have been equipped with CarMedialab's charge management system to ensure that the e-buses are always on time and fully charged.



Keolis Netherlands has been operating around 250 electric buses in the provinces of Gelderland and Overijssel since 2020. This will enable the transport company to save around 16,000 tons of CO<sub>2</sub> annually. The buses can be charged at more than 170 charging stations using MOBILEcharge to save costs.

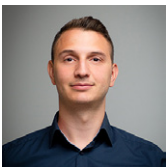
## MOBILECHARGE IS THE TRUSTED SOLUTION:



1.250+ charging stations fully integrated

2.000+ e-buses charging efficiently

## CARMEDIALAB IS THE TECHNOLOGY MARKET LEADER



### Contact us!

Would you like to learn more about intelligent charge management?

Then contact me: [leandro.campo@carmedialab.com](mailto:leandro.campo@carmedialab.com)

### CarMedialab GmbH

Building 5112 | Werner-von-Siemens-Straße 2-6 | 76646 Bruchsal | Germany

Phone: +49 7251-7240 0 | [info@carmedialab.com](mailto:info@carmedialab.com) | [www.carmedialab.com](http://www.carmedialab.com)



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