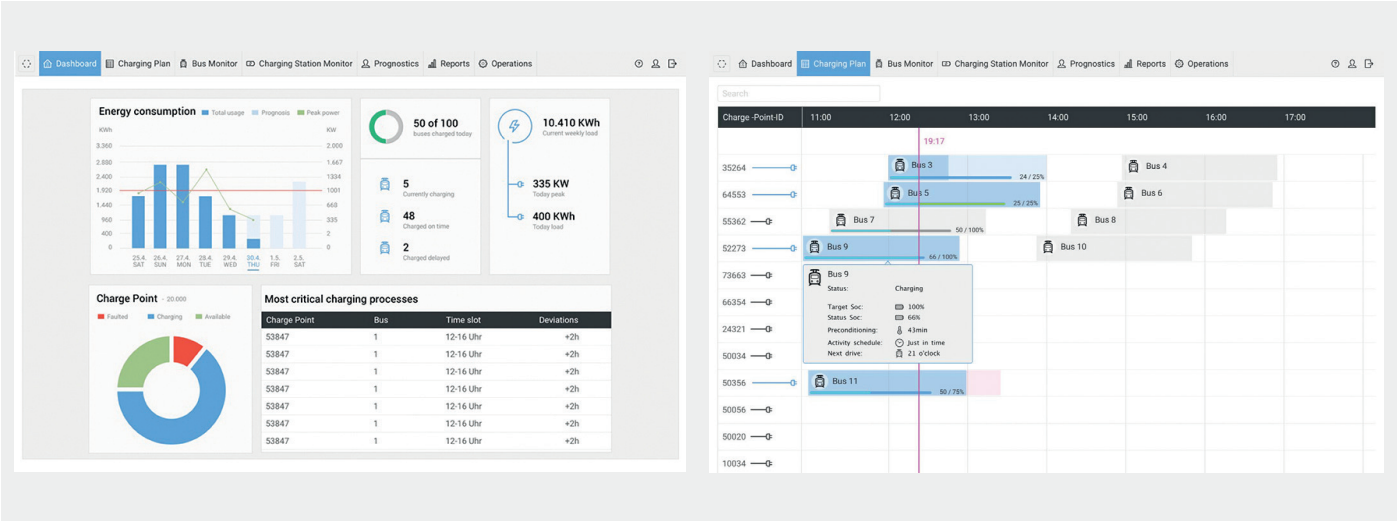


WHITE PAPER

# Introducing a Charge Management System: Three Success Factors Gained from Project Experience

## Introduction: The Goal Is an Intelligent Charging Concept

The INIT Group supports transport companies who want to convert to electromobility by offering solutions such as an Intermodal Transport Control System tailored to electric bus requirements, a planning and depot management system and a range prediction system, and, not least, a sophisticated charge management system. The latter is supplied by the INIT subsidiary, CarMedialab. With its software application MOBILEcharge, CarMedialab has been involved in a range of projects since 2019. An increasing number of transport companies is coming to realise that controlling a fleet using this new way of refuelling is so complex that it needs the help of an intelligent charging system. From a relatively small fleet of five electric buses to a fleet of over a several hundred electric vehicles in several different locations, all projects carried out by CarMedialab so far have had one thing in common: They all target an intelligent charging concept which ensures that all vehicles are charged in accordance with requirements, as cost efficiently as possible while being gentle on the battery, preconditioned if necessary and ready to go with the correct amount of charge when it's time to move out. In a complex interplay between charging and IT infrastructure and the vehicles, CarMedialab has been able to gather valuable experience over the past three years. So, what factors need to be taken into account for successful charging management projects?

**CarMedialab has wide-ranging project experience. This shows GUB (Gamla Uppsala Buss, © Jonas Bilberg)**

## 1. Iterative approach and good communication between all parties involved

One thing is certain: Transport companies are breaking new ground by entering into the world of electromobility and do not yet have much experience to fall back on. This makes it even more important for all parties to be in close contact and exchange information at regular intervals. Each project is a new challenge to meet the most diverse system requirements, in particular in regard to the IT network and what is required for introducing a charge management system. In addition, the process chain of vehicle, charging infrastructure, charging management and, where relevant, downstream customer systems (depot management and planning systems) requires establishing complex data communication. It makes sense to plan the implementation using a number of iteration phases which will identify any errors that occur at an early stage. To ensure a smooth process, CarMedialab is involved early on to advise and support not only transport companies but also other partners, such as manufacturers of charging infrastructure who play important roles as additional parties in the project process.

## 2. Interoperability of system components

Complex data communication requires that each of the system components required for the charging process is based on standards which have been developed to

deal with the increasing importance of electromobility over the past number of years. Communication between vehicle components is regulated to date using FMS (Fleet Management Standard). This is a protocol which was developed by a consortium of vehicle manufacturers to ensure that vehicle data can be transferred consistently to the on-board computer regardless of manufacturer. Standards to regulate communication between vehicle and external components are:

- OCPP (Open Charge Point Protocol), an application protocol that standardises the data transfer between charging stations and a charge management system
- ISO 15118 for communication between charging station and vehicle
- The interface for preconditioning based on VDV (Association of German Transport Companies) specification 261 and the communication required for this between the charging management software and the vehicle via the charging station.

The VDV advises and supports its member companies and politicians, supports the exchange of experience and know-how between the members and prepares technical, operational, legal and economic principles. VDV specification 463 was established just last year with the collaboration of CarMedialab for communication between the external components, depot management and the charge management system.
These interfaces enable all the different system components to interoperate based on specific rules which is essential for the exchange of data.
Another factor also frequently complicates matters. Within a project, vehicles and charging stations are often made by different manufacturers and spread over different locations. These components also have to be mapped and managed by the central charging management software.

## 3. Involving experienced project partners

Despite existing standards, the implementation of a charge management system is not simply a case of "plug and play". The greatest challenge faced in any project is establishing high quality and standard compliant communication between the components. The standards need to be implemented correctly to ensure that the data content meets the requirements of availability and depth of detail. This makes it even more important that a suitable charging management provider can demonstrate sufficient expertise in implementing these standards.
Whereas communication using OCPP often works well, "preconditioning the vehicle" as required by VDV specification 261, still requires a considerable amount of test effort. CarMedialab collaborates with different vehicle manufacturers to support implementation and ensure correct preconditioning. Adopting ISO 15118 (communication between charging station and vehicle) also requires a great amount of detail and a high level of expertise coordinating with vehicle manufacturers.

**An intelligent charge management system ensures that all vehicles are charged as needed, cost-effectively and in a way that conserves batteries (© Ulrike Kabel/INIT)**

A further standard is important to ensure the smooth operation of electric buses as it is important to know certain vehicle conditions at all times, such as the charging status and the remaining battery capacity: the standardised FMS interface for transferring vehicle data to the on-board computer. Data availability and the quality of data transferred is hugely important as the range is limited by current battery capacities and doesn't allow reserves for several days of operation, the energy consumption of electric buses depends on a range of factors (such as the topology of the route, the driving style, and especially, air conditioning the vehicle) and the range does not decrease linearly as a result. These are not yet available to a sufficient degree in all vehicles. In addition, the FMS interface which was originally developed for diesel motors does not yet have enough e-mobility parameters. A detailed standard is therefore required which should be regulated by the pending VDV 238 specification. Until then, a competent partner in implementing charge management systems is essential to support the data transfer.

## Conclusions

In conclusion, the charge management system as a central system which regulates the interaction of different components comprising the electric bus, operating conditions, charging infrastructure and, where relevant, depot management is of great importance for the successful introduction of electromobility. The standards which have been established over recent years have made important progress in terms of interoperability. However, in many areas, the standards are not specific enough or take a long time to implement. In addition, most transport companies do not yet have enough experience with electromobility. As a result, it is essential for the project partners to coordinate closely and to establish an iterative approach for each phase of the project. It is also important for all parties involved in the project to be well acquainted with the requirements of norms and standards and to implement them accordingly; a charging management provider with solid project experience and precise knowledge of the standards is indispensable. ■

Author: Stefan Krause