SITE-SPECIFIC OPTIMIZATION OF CHARGING INFRASTRUCTURE FOR FLEETS AND COMPANIES

Concepts for eMobility charging hubs and depots

At a glance

The increasing share of electric vehicles (EVs) will have a large impact on mobility service fleets and workplace charging. Companies, retailers, and fleet operators need to evaluate the future charging demand and derive viable charging concepts.

As expert consultants in the field of electromobility, Siemens PTI supports companies, fleet and workplace charging operators in identifying suitable and cost-efficient solutions and technologies which meet their individual requirements. With an eMobility hub or depot charging concept from Siemens, clients receive:

- Definition of mobility services & concepts, business model and value chain elements & stakeholder
- Detailed load forecasts and profiles for specific charging sites
- Determination of the required number and types of charging points
- Solutions for grid connection and optimized power supply
- Consideration of tariffs and regulatory & taxation aspects
- Definition of IT system landscape, software requirements & interfaces
- Definition of charging & accounting processes and operational concept

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The challenge

In a constant trend towards an increasing adoption of electromobility, total cost of ownership of electric vehicles is gaining competitiveness.

In combination with the smaller carbon footprint as compared to combustion engines, these are drivers for fleet operators to consider the electrification of their fleet. To do so, fleet operators need viable and flexible charging infrastructure concepts and a charging management system to optimize the required infrastructure, operation, and energy consumption.

At the same time, enterprises and retailers need to start supporting workplace charging for their employees. The provided services should be compliant with regulatory guidelines – mandatory or voluntary – such as tax benefits for emission reduction. To enable workplace charging and ensure smooth operations, EV charging system needs to be integrated into energy and building management systems and connected to existing charging management and customer management systems.

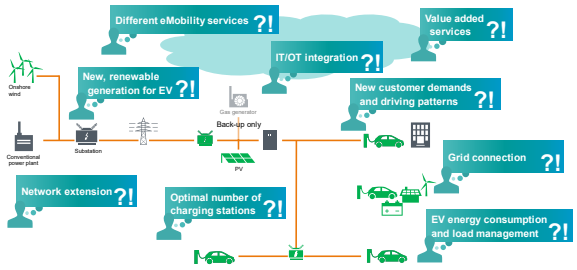

Figure 1: Challenges of eMobility

Our solution

Siemens PTI offers a holistic charging hub concept for fleets and workplaces which considers technical as well as economic aspects.

The development process consists of five sequential modules. This methodology ensures a transparent and detailed evaluation of different variants for the development and supply of the charging infrastructure, supporting clients in their decision-making process.

Strategy definition

The required charging infrastructure largely depends on the specific fields of application and services, mobility requirements and patterns, as well as the defined business models for eMobility. Therefore, prior to any technical evaluations, framework conditions, existing concepts, value chains, stakeholder groups and geographical demand models are analyzed. This evaluation of the status quo and strategy includes identifying possible charging sites which shall be considered in the following technical analyses.

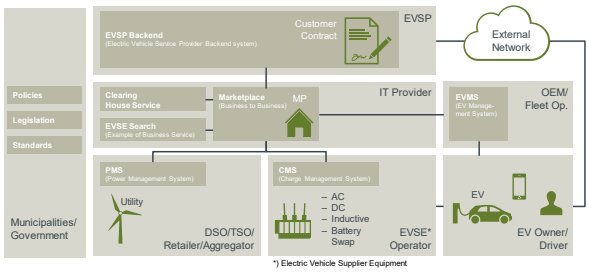

Figure 2: Overview of eMobility eco-system

Demand modeling

To determine the exact charging demand at the specific charging hub or depot, the status-quo information is complemented with the anticipated or current consumption patterns and then evaluated for different concepts (e.g., central charging station, “satellite” stations).

One of the key challenges during the evaluation of the necessary EV infrastructure is the identification of the optimal techno-economic ratio between EVs and charging points (CPs). In parallel, the EV supply equipment varies broadly across CPs in terms of voltage level (power output range of the CP), type (socket und connector used for charging) and mode (EV-CP communication protocol). To evaluate the optimal power level and number of CPs per charging station or hub, several aspects must be considered and rated as different objectives.

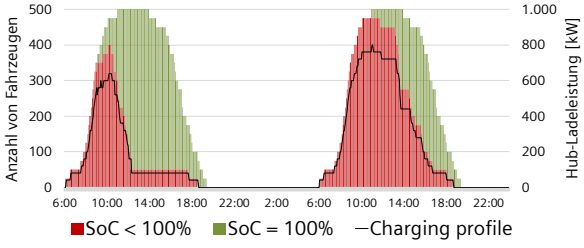

Figure 3: Exemplary results of a charging profile simulation

In accordance with the customer-specific objectives, Siemens PTI analyzes multiple scenarios and variants to identify the appropriate level and number of CPs per charging station with iterative charging profile simulations.

Energy supply & network integration

After the required charging infrastructure has been defined, the supply and grid connection of the charging hub or depot need to be assessed. If necessary, by means of simulations different measures can be identified to avoid overloading, grid code violations or other critical conditions.

In addition, these simulation results provide a techno-economic evaluation of the different charging strategies and technologies. Different solutions, such as different local generation capacities (e.g., fossil vs. renewable, distributed energy resources – DER), network and energy price developments are compared, and different options for grid connection are considered. Based on this scenario comparison, the optimal measures for short, medium, and long-term planning can be derived.

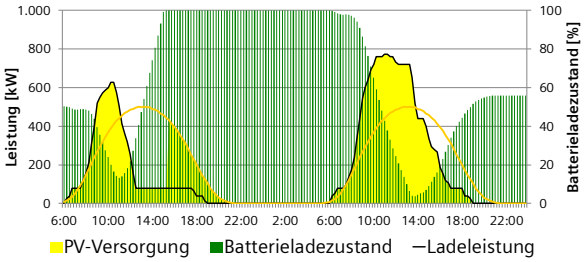

Figure 4: Exemplary simulation of PV and energy storage to cover the load demand

Process integration and operational concept

To support a smooth integration of the future charging processes into the existing process landscape, all relevant existing processes are identified. Then the individual process steps, actors as well as the integration into existing or new software applications are examined.

To ensure compliance and smooth operation, regulatory guidelines, policies, and best practices on (inter-)national level are incorporated during process definition. The results include concrete implementation solutions and a roadmap considering feasibility, market trends and international best practices.

As part of the integration into software applications, such as the backend system of the charging point operator for charging management, required IT interfaces are defined. Based on the defined processes, the functional requirements for hardware (e.g., charging power, socket, authorization media, IT protocols) and software (e.g., intelligent load management at the charging stations) can be defined.

Roadmap development

All results, analyses and recommendations are then combined into an integrated concept. For the selected charging infrastructure and supply scenarios, the investment and operational costs for the charging infrastructure, supply and network infrastructure are defined and distributed across a predefined time span.

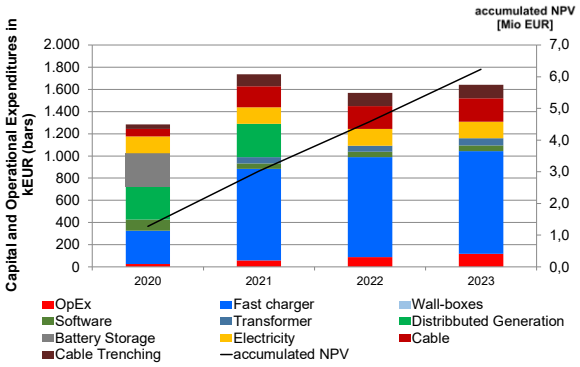

Figure 5: Example of a scenario comparison

Once the preferred scenario has been selected, another iteration of the techno-economic analysis is performed and used as a basis for a detailed implementation roadmap to describe the final, bankable option.

In consequence decision makers can identify required investment budgets and resources, involve further stakeholder, where necessary, and develop a concrete timeline and project description for the implementation of charging infrastructure.

How you can benefit

Our clients receive an integrated charging infrastructure concept which:

- complies with their eMobility strategy and meets the requirements of their customers as well as other stakeholders
- is vendor-agnostic and considers innovative charging, generation and storage technologies, software, and processes
- weighs up the redundancy of charging points and cost-effectiveness, ensuring a both technically and economically efficient and sustainable solution
- considers regulatory requirements and incentives, and ensures compliance with applicable policies and guidelines
- ensures a secure and reliable grid connection considering the local grid codes

If you are interested in identifying your individual optimal charging hub concept, feel free to contact us.

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100 Technology Drive
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For more information, please contact power-technologies.energy@siemens.com use our web contact form.

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