Moving with energy into a mobile future

Innovative infrastructures for the electromobility of tomorrow

Answers for energy.
Demographic change, increasing urbanization and industrialization – the reasons for the world’s growing need for energy are many and varied, and ultimately, they are the byproduct of development. But limited resources combined with a warming climate and its consequences make it essential that we find sustainable, integrated solutions to maintain our precious natural environment.

Comprehensive and sustainable
Part of any such solution is to re-examine our mobility with an eye toward minimizing CO₂ emissions. As an integrated technology company and pioneer in electrical engineering for over 160 years, Siemens has an unrivaled ability to create the conditions for innovative, integrated solutions for worldwide electromobility.

The clean solution: electrical energy
Electrical energy can be generated in a sustainable energy mix. And it offers another key benefit: it is available almost everywhere, making the building of a comprehensive charging infrastructure feasible. Charging poles will become a fixture in the contemporary urban landscape in the foreseeable future, making it possible to charge vehicles wherever they are parked – at home, at shopping centers, in front of restaurants or in parking garages.
Reliable, intelligent energy supply – for tomorrow’s mobility

Experts predict that there will be 19 million electric vehicles by 2020 – with two to four million of them in Germany. Providing these vehicles with power will require a corresponding charging infrastructure and intelligent power supply networks: smart grids are the prerequisite for clean electromobility.

New challenge: the intelligent infrastructure
In the past, power grids only needed to work in one direction – from the energy producer to the consumer. Today’s grids need to ensure an uninterrupted supply of power despite a higher degree of decentralization among suppliers, stabilize fluctuations in the feed from renewable energy sources, and at the same time help reduce CO₂ emissions. They are also expected to connect those in the market with each other and enable them to cover their individual power needs as cost-effectively as possible. This requires a realignment of the infrastructure in order to transport not only electrical energy, but also information. With innovative communications and control technology from Siemens, it is already possible today to make comprehensive information about energy supply and demand available at all times, facilitating the optimal interplay of all relevant components, suppliers, and consumers in the network. Siemens is thus smoothing the way for electromobility with advanced solutions for an intelligent and flexible infrastructure.

Electric vehicles can do more: electromobility as a key component of smart grids
Millions of electric vehicles with their batteries will not only consume power but also play a key role in the smart grids of tomorrow. When parked for long periods of time and plugged into the grid, electric vehicles can make use of the excess energy generated at night by wind power – and use this stored energy for mobility or to cover peak loads during the day. In this way, electric vehicles help stabilize the power grids and can help increase the share of renewable energies.
Comprehensive delivery from a single source

Siemens has a comprehensive portfolio of products and services for electromobility – from infrastructure equipment such as charging poles to bundled solutions for the drive and the control unit of electric vehicles. In addition to its standard portfolio, Siemens offers DC charging stations and battery swapping equipment as well as the necessary measuring equipment and network planning services. Energy management solutions control such elements as bidirectional charging processes and the availability of charging stations in the smart grid. This is complemented by numerous hardware and software solutions for system management, including solutions for capturing energy consumption data, payment data processing, fleet management, navigation and traffic congestion services, and assistance in locating the next available charging station.

"Gas tank" of the future

In a near future recharging will be the most natural thing in the world – and it will be completely convenient! When a vehicle is connected to a charging point, it is first identified. The contract data for the vehicle is checked, and information about the possible charging capacity is transmitted to the vehicle. Once approval is given, the charging process begins. The fee can then be paid on the spot, for example at an on-site pay terminal, or in the background via a mobility contract. For these communications tasks, the actual network operations layer with the charging and energy distribution hardware is supplemented by a control and communications layer.

The next steps

Beginning with individual solutions designed primarily for charging at home or at work, the market will see the development of a variety of solutions for public-access charging or for special fleet solutions as the number of electric vehicles on the road increases. This process will be further accelerated by electromobility service providers. Here Siemens is developing both comprehensive and specific solutions, based on standard products and services, in order to leverage the full potential.

Electromobility places special demands on the network and the energy providers. After all, drivers of electric vehicles need the security of knowing that they can easily recharge their vehicles anywhere. At the same time, payment for the supplied electricity must function smoothly at all points.

Actively leveraging system advantages – for the mobility of tomorrow

The infrastructures inside and outside of electric vehicles must be developed using an integrated approach.
Viable into the future: products for electromobility

Siemens is systematically moving ahead, developing and selling a variety of products today that cover the full spectrum of electromobility. These include individual solutions for charging vehicle batteries as well as integrated software solutions.

AC wall box from 3 kW/230 V to 22 kW/400 V –
The space-saving charging solution, versatile and reliable
With the wall box, drivers no longer need to drive to a "fuel station" every time they need a charge. This innovative technology makes it possible to charge vehicles nearly anywhere, even at home, where cars typically stand unused for many hours each night. The compact wall box takes up very little space and can be quickly and easily installed or retrofitted to enable charging in enclosed private areas or public parking garages. The wall box can also accommodate optional communication modules to connect to the expanded services already available in the smart grid.

AC charging pole from 3 kW/230 V to 22 kW/400 V –
The charging pole with built-in reliability
Siemens has developed an innovative charging pole for public charging (public parking lots/garages for shopping centers and office buildings). Customized, application-specific solutions are possible thanks to modular options such as selective protection settings for flexible energy connection options and a diverse portfolio of services for approval, identification, remote monitoring and control, counting and billing. The operation center is linked through the communication module. The charging pole features lockable plugs, compliance with the relevant IEC standards respectively. CE mark of conformity and its robust construction makes it the first choice for outdoor installations.

AC charging point system up to 7.7 kW/240 V –
The charging point system for America
Siemens offers a flexible charging system for the American market, where UL certification requirements play an important role. Depending on the type or location of intended use, the charging system is offered as a charging pole or wall box. The system is capable of exchanging data with an operation center. Other conveniences include functions such as real-time remote monitoring and firmware updates.

AC charging satellite systems from 3 kW to 22 kW/400 V per satellite –
The modular charging pole concept for large-area applications
The Siemens systems are also available as satellite systems. Functions such as charge control and payment are concentrated in a central point, while the actual charging is handled by secondary-level charging poles. Such systems are also able to communicate with operation centers.

DC charging system up to 50 kW/input voltage 400 VAC –
The reliable fast-charging system
Direct current (DC) charging stations capable of quickly transferring large amounts of energy into electric vehicles will become the norm, similar to today’s gas stations. An all-weather outdoor cabinet will deliver direct current from a separate installation point, and "electric fuel pumps", the so-called "posts" will be used for fast-charging.

Contact-free charging using induction
So-called "inductive charging" offers a further option for charging electric vehicles without a charging cable. In this process, a coil system is built into both the vehicle (for example, on the underside) and the charging station (for example, in the base plate). Energy is transferred from the charging station to the vehicle contact-free by means of an alternating magnetic field that penetrates this coil system. The charging process can thus be automatically started by simply driving over the charging station – with no need to get out of the vehicle or connect a charging cable. This technology will make it possible to use cable-free charging points in the future, for example for taxis, buses, company parking areas or parking places at home.

Software solutions for electromobility –
individual handling, central control
Siemens offers a comprehensive electromobility software portfolio – from infrastructure solutions for energy and fleet management to business solutions and value-added user-guided applications. These software solutions are interoperable and can be combined into custom solution packages.

Contents of the electromobility software and solution portfolio:
- Solutions for monitoring and remote control of charging hardware
- Infrastructure maintenance solutions
- Energy and load management solutions (smart grid integration)
- Back-office ERP, CRM, billing solutions
- Portal and service desk solutions
- Security, identity and access management
- Battery asset management
- Vehicle integration and charging interaction
- Fleet management
- Ecosystem and business case simulation

The DC charging stations of tomorrow will let drivers quickly “refuel” their electric vehicles without delay on long trips.

Swapping station for fast battery change
An alternative to fast-charging is to exchange depleted batteries for fully charged batteries at so-called swapping stations. Swapping stations offer drivers many benefits and are particularly reliable, since all the electrical elements are kept within a closed process or system. Swapping is quick and easy – and facilitates long-range travel without long waits. The operators of swapping stations can also offer their stored batteries to the grid as flexible storage units, helping to stabilize the grids through active control of the charging cycles. They also provide an opportunity to utilize excess energy – such as that generated at night through wind power – for electromobility.

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Projects for the future of electromobility

Siemens not only offers hardware and software solutions for electromobility but is actively field-testing how components interact with one another and how they match driver needs. These tests, conducted under real-life conditions, provide new insights into the suitability of Siemens solutions and the demands that will emerge in day-to-day nationwide use. Siemens has its own pilot projects and participates in joint projects with local energy suppliers and further companies.

Project 4-S (4-SustainedElectromobility)
This Siemens field study involves acquiring a test fleet of 100 vehicles that Siemens employees will test to assess the suitability of electric vehicles in day-to-day use throughout Germany. The aim of the project is to obtain greater insight into the habits of drivers and collect reliable data on any vehicle and infrastructure needs that the study identifies. This study underscores the integrated approach taken by Siemens in the emerging market for electromobility.

Details of project:
- Siemens is putting together a test fleet of 100 electric vehicles in Germany
- Siemens employees are testing the vehicles along with the corresponding infrastructure through routine usage
- The focus is on practicality and user acceptance to determine what customers require from the vehicles and infrastructure
- User experience flows directly into the ongoing development of products and solutions

Project Pilot Region Electric Mobility Munich
Siemens is collaborating with BMW and the Stadtwerke München (SWM) public services authority in a joint electromobility project in the pilot region of Munich. The project partners will study user behavior and preferences based on various scenarios (use cases) while simultaneously developing and experimenting with innovative technical components, products and systems for electromobility. The project is subsidized by the Federal Ministry of Transport, Building and Urban Development.

Scope of project:
- Duration: March 2010 to June 2011
- Geographic area: Munich and environs

Objectives:
- Provide 40 MINI E cars to private users and fleet operators for a ten-month field study of user preferences
- Develop and test a future-oriented charging infrastructure consisting of 32 public charging poles and 36 home charging stations. SWM is operating the charging infrastructure and providing green electricity

Technical specifications of charging poles:
- Charging capacity 3.7 kW to 22 kW
- Connection: Schuko® safety outlets, three-phase IEC type 2 connection
- RFID card identification

Technical specifications of home charging stations:
- Charging capacity 22 kW
- Three-phase IEC type 2 connection

Develop a universal fast-charging system, test in lab and with BMW ActiveE
- Study and feedback in various charging scenarios. Develop technical measures to support and improve quality of grid