

German Charging Infrastructure Regulations

Supporting Dutch companies understanding the German framework



Document

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Client

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Executive summary

Many Dutch companies are leading in the development of charging infrastructure for electric vehicles, including the hardware, back-offices, communications and operation. Their aim is to act in foreign countries. Therefore they need to understand the specific policies and regulations in these countries to successfully adapt their products, services and solutions to enter these markets. This publication gives an understanding of the main German regulations for (public) charging infrastructure from a Dutch perspective.

The German legal framework for charging infrastructure consists of:

- Low-Voltage Grid Connection Ordinance (Niederspannungsanschlussverordnung): the NSV regulates, among other things, the influence of DSOs on the approval of new charging stations. Installations without a permission are not allowed.
- Federal Building Code (Baugesetzbuch): the BauGB defines the principles and procedures to be followed by municipalities when drawing up land-use plans. This may include charging infrastructure, and there are specific situations where a new charging station is permit-free and where it is not.
- Charging Station Ordinance (Ladensäulenverordnung): The LSV regulates the main aspects of operating charging infrastructure, authentication, use, payments and interoperability for AC and DC charging. To comply to these requirements, direct payments and German and English user menus have to be taken into account.
- Calibration Law and Regulations (Eichrecht): the Calibration Law sets the requirements to be complied with for the measuring instrument in order to be state-of-the-art to ensure correct measurement results within the German Law. Therefore, the metering and processing of measured values must fit all requirements, which is currently hard to fulfill. ISO 15118 is seen as a long-term solution.
- Regions and cities might have specified regulations or policies for charging infrastructure that have to be taken into account.

Dutch companies who are willing to enter the German market are recommended to involve local knowledge to comply successfully with German regulations. Starting early and understanding the market positions is important.

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1. Introduction

Dutch companies in the field of charging infrastructure and charging services are becoming increasingly familiar with the German market, thanks in part to the PiB E-Mobility Partners. They are ready to offer their products and services in Germany. In doing so, they are confronted with German law and regulations that can lead to ambiguity if products and services comply to law and regulations.

Dutch companies have questions regarding the payment systems that should be available, the security requirements for charging infrastructure and data transfers and, want to understand the German Eichrecht situation in more detail. To support Dutch companies to comply with the German regulations regarding LSV and Eichrecht, APPM GmbH has, in cooperation with SuMoCo, conducted a concise analyses that will lead Dutch companies to be (more) clear about how they can meet the requirements.

This report is an result of an analysis of the German regulations for public charging infrastructure from a Dutch perspective. The report provides an overview of the German regulations regarding charging infrastructure for electric vehicles (chapter 2), and focusses on the Ladesäulenverordnung (LSV), Eichrecht and local and regional policies (Chapter 3 till 5). Furthermore, the report provides an comparison between the Dutch 'national standards in use' for charging infrastructure (provided by the Netherlands Knowledge Platform for Charging Infrastructure, NKL) and the German regulations. The report finally contains some conclusions and recommendations for Dutch companies willing to enter the German market.

2. Legal framework

The German regulations for charging infrastructure consist of several kind of regulations. The table below provides an overview of the actual regulations. All of them apply to (semi-)public charging infrastructure and some of them to private charging infrastructure. Charging infrastructure can only be seen as private when a site is only accessible with the permission of the owner and is used without any commercial services.

Legislation	(Semi-)public	Private	Cont. in
Niederspannungsanschlussverordnung (NSV) – Low-Voltage Grid Connection Ordinance (LWGCO) The LWGCO regulates, among other things, the influence of DSOs on the approval of new charging stations for electric vehicles. Installations without a permission are not allowed.	✓	✓	Appendix 1
Baugesetzbuch (BauGB) – Federal Building Code (FBC) The FBC defines the principles and procedures to be followed by municipalities when drawing up land-use plans. This may include charging infrastructure, and there are specific situations where a new charging station is permit-free and where it is not.	✓	~	Appendix 2
Ladesäulenverordnung (LSV) – Charging Station Ordinance The LSV regulates the main aspects of operating charging infrastructure, authentication, use, payments and interoperability for AC and DC charging.	✓	✗	Chapter 3
Eichrecht – Callibration Law The Calibration Law sets the requirements to be complied with for measuring instruments in order to be state-of-the-art to ensure correct measurement results within the German Law.	✓	✗	Chapter 4
Regional regulations All kind of regional polices and regulations that apply to charging infrastructure.	✓	✗	Chapter 5
Legend:	✓ Applies	~ May apply	✗ Does not apply

3. Ladesäulenverordnung (1/3)

The Ladesäulenverordnung (LSV) or Charging Station Ordinance regulates the main aspects of operating charging infrastructure, authentication, use, payments and interoperability for AC and DC charging. Basis for the Charging Station Ordinance on a national level is the Energy Industry Law (Energiewirtschaftsgesetz, EWG) - §49 IV, 1 ENWG to be precise. Prerequisite on EU Level is the Directive 2014/94/EU of the European Parliament and the Council on the development of alternative fuel infrastructure issued on 22. October 2014.

Historical developments

After a comprehensive discussion mainly focusing on the fact that the Charging Station Ordinance was considered too intrusive compared to the Directive 2014/94/EU, the Ordinance got adopted unchanged by the governing German federal parliament on 28. October 2015. Due to ongoing criticism concerning the definition of "public charging points" which was considered too far-reaching, the preference of the Combined Charging System technology as well as the bureaucratic, technical and cost burdens, it took another four months until the ordinance finally got approved on 03. March 2016 by the German Federal Council.

The Charging Station Ordinance in its version prior to the current amendment needed to be supplemented in some aspects. According to § 1 LSV, these included the operation of charging points, i.e. authentication, use and payment. This amendment to the Charging Station Ordinance was adopted by the German Federal Council on 12. May 2017.

Authorities

The Bundesnetzagentur (BNetzA) or Federal Network Agency is the German regulatory office for electricity, gas, telecommunications, post and railway markets. It is a federal government agency of the German Federal Ministry of Economics and Technology and headquartered in Bonn, Germany. It is the regulatory authority in the sense of the charging station ordinance. This agency is also the formal authority responsible for any topics regarding the Ladesäulenverordnung.

3. Ladesäulenverordnung (2/3)

Contents of the Ladesäulenverordnung

The table below provides an high level overview of the contents of the LSV including the included regulations. Please note that the LSV is quite a short document with just a few articles.

§	Content
1	Area of application The LSV regulates the minimal technical requirements for publicly accessible charging infrastructure for electric vehicles in Germany.
2	Definitions Contains all definitions in the LSV. A translation can be found in Appendix 3.
3	Technical requirements regarding safety and interoperability <ol style="list-style-type: none">Each AC (≥ 3.7 kW) charging station should be equipped with Type 2 connectors in accordance with the DIN EN 62196-2, issued in December 2014Each DC charging station with the possibility for AC charging should take condition a. into accountEach DC (> 22 kW) charging station should be equipped with a Combo 2 connector in accordance with the DIN EN 62196-3 issued in July 2012
4	Billing requirements Each electric driver should be able to charge and pay spontaneously at any time, without any contract with a service provider signed beforehand. The regulation is intended to enable the unhindered use of electric vehicles across operators, municipalities and countries. Authorities can choose between the following variants: <ol style="list-style-type: none">Authentication is not required when using the charging station without any payment.Cash payment or cashless payment (standard card-based payment system such as a credit card) in the immediate vicinity of the charging point.Web-based system (meaning a QR-code, app or website) including at least one variant of access to the web-based payment system (i.e. PayPal, Credit Card or others), which must be available free of charge. The menu navigation for charging should be available in at least German and English.

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3. Ladesäulenverordnung (3/3)

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§ Content

5 Notification

The following notifications are mandatory:

- a. Charge Point Operators are obliged to inform the authority at least 4 weeks in advance for the construction of a new charging station and immediately after a new charging station has been put into operation.
- b. Charge Point Operators have to prove that they meet the technical requirements by sharing the relevant documents, at least at the construction of a new charging station and at any moment that this is requested by the authority.

6 Authorities

The responsible authority is allowed to verify on a regular basis that the technical regulations in § 3.2 till 3.4 are met for fast charging stations. The authority is allowed to prohibit the operation of the charging station if the requirements in §3 and 4 are not fulfilled.

7 Low power charging

Charging stations with a charging capacity < 3.7 kW are excluded from the LSV regulations.

8 Transition period

Charging stations installed before December 14, 2017 are excluded from the regulation in §4.

4. Eichrecht (1/5)

The topic which is known to Dutch companies as 'Eichrecht' contains several German regulations that have to be taken into account regarding charging infrastructure. An overview is provided in the table below. The regulations have to be seen in the sense of consumer protection. The calibration of a measuring device is always necessary when the sales price is determined by the measurand. The consumer has the right to unambiguous evidence of how the sales price was determined. Thus, the regulations are applicable to charging stations for electric vehicles whenever the charging session price is determined either by consumed energy (kWh), used power (kW) and/or by time (minutes).

Currently, the payment per consumed energy or connection time is only legally correct if it fits to the mentioned regulations. Known and permitted alternative solutions are charging for free, lumpsums and flat rates.

Regulation	Explanation
Weights and Measures Act (or Calibration Law)	The Weights and Measures Act (German: Mess- und Eichgesetz - MessEG or Calibration Law) gives the foundation for "the placing on the market and making available on the market of measuring instruments, their use and calibration". It sets the requirements to be complied with for measuring instruments in order to be state-of-the-art to ensure correct measurement results within the German Law.
Weights and Measures regulations (or Calibration Regulation) <i>Till February 2007 known as Calibration Ordinance</i>	Provisions for consumption meters (water meters, gas meters, electricity meters, etc.) are regulated in the Weights and Measures Regulation (or Calibration Regulation) as well as associated guidelines to conduct these calibrations. The Weights and Measures Regulation is the "Regulation on the placing on the market and making available on the market of measuring instruments, and on their use and calibration" (German: Mess- und Eichverordnung - MessEV).
Regulation on Price Indication	The regulation determines how the price for offering goods or services is to be indicated in relation to the end consumer. The purpose of the Price Indication Regulation is to ensure price truth and price clarity for offered goods or services. The Price Indication Regulation has been in force since 1985, with interim changes.

4. Eichrecht (2/5)

Complying with the regulations is focused on calibrated metering and data security. These two topics are described below.

Metering

All physical measurands (kWh, kW, minutes...) which will be used for billing have to be measured by calibrated meters. If measurement values from a charging station will be used for billing purposes, the meter has to be calibrated and the measurement cell registered. Measurement devices have to be selected according to the application. That means for DC charging systems, it is not allowed to use AC measuring devices before the AC to DC conversion.

Calibrated and type-tested AC kilowatt hour meters are available on the market. For DC, there are no measuring instruments that comply with calibration law, unless very large devices originating from the railway sector. Some manufacturers of energy meters and some charging station manufacturers are working on a technical solution themselves. Some already entered the conformity assessment to obtain a type examination certificate. For first suppliers it is expected to be granted in Q2 2019.

Secure process chain

Beyond the conformity of the meter and its integration in the charging system itself, also the whole process chain has to be compliant with the Calibration Law and Regulation. Operators are faced with the challenge that when further processing the measured values in a backend, not only the measuring device in the charging station, but also the backend or the transmission must meet the legal requirements for calibration. If measuring values are used for billing, it has to be ensured by appropriate systems that the values are original and authentic. Furthermore, operators (Charge Point Operator as well as the mobility operator, MO, or mobility service provider) have to provide instruments to their customers to check and verify the origin and correctness of the provided measuring values on their receipts. According to paragraph 7 of the Measuring and Verification Regulation (MessEV), measuring instruments must "present the measurement results in a suitable form and process them securely against falsification" and "be testable".

4. Eichrecht (3/5)

The minimum components of a data record are (source PTB):

- Measurand: e.g. meter start and stop value or difference
- Unit of measurand
- Time stamp
- Unique ID of charging system (e.g. EVSE-ID or Meter-ID)
- Identification of consumer (e.g. EMAID, Session-ID, UID, RFID)
- Cryptographic signature of the entire dataset

Relevant authorities

Office of Weights and Measures of the federal states (calibration authorities)

The performance or monitoring and enforcement of calibration is the responsibility of the federal states in the Office of Weights and Measures. This also means that for each federal state, calibration authorities could evaluate the situation and act on the enforcement differently.

Physikalisch-Technische Bundesanstalt (PTB), located in Braunschweig

Physikalisch-Technische Bundesanstalt determines the conformity of a product with Calibration Law. The second role of the PTB is to advise the state calibration authorities. Upon request, the PTB initiates a conformity assessment procedure and issues a type examination certificate for the meter and the charging system.

AGME (Arbeitsgemeinschaft Mess- und Eichwesen)

The Working Group for Metrology and Calibration is the coordinating body of the verification supervisory authorities of the 16 federal states. It has a secretariat and the chair changes every two years.

4. Eichrecht (4/5)

Current solutions that are used in the market

Currently, two solutions have established themselves in the market, which enable the billing of charging sessions in accordance with Calibration Law. On the one hand, the requirements of the Weights and Measures Act (MessEG) can be implemented by installing a so-called local storage and display module (SAM) directly at the charging station on site. However, this requires adjustments to the hardware as well as an on-site check of measured values at the charging stations if these are called into question by consumers.

On the other hand, it is also possible to apply a digital signature to the measured values generated in connection with a charging process. For this purpose, a "transparency software" is required which performs a signature check and presents the correctness of the invoiced data in a manner that is conclusive. This solution is the so-called "favorable solution in the sense of the calibration requirements". It is an end-to-end signature of recorded measured values, so that a consumer is able to check the correctness of the recorded values without any doubt. The transparency software checks the digital signatures of the measured values for correctness. It uses the signature data and the so-called "Public Key", i.e. the public key of the measuring unit, which is applied to the charging station. With the signature verification, it is finally possible for the consumer to check the measured values for correctness.

Both methods described are basically applicable to both AC and DC charging devices.

4. Eichrecht (5/5)

Future outlook

End of November 2017, the calibration authorities informed that no executive measures will be taken against charging infrastructure (AC or DC) during a transition period until 31. March 2019. In an exchange between representatives of the Ministries of Economics and Transport as well as the state calibration authorities and AG 5 of the National Platform "Future of Mobility" on 18. January 2019, an interim solution was agreed to. According to this, Charge Point Operators (CPOs) are to be given the opportunity to obtain an extension of the deadline if they present a retrofit plan. This has to be discussed individually with the calibration authority of the federal state where the CPO has its branch office.

Another more long term solution that is discussed, is the introduction of ISO 15118 as a communication standard between the electric vehicle, charging station and back-offices which is expected to solve the issues for a secured and validated data connection as requested in the Calibration Regulation. The relevant feature in ISO 15118 is security, using digital certificates both on the transport layer as well as for contracts on the application layer (instead of using charging cards). This also enables securely exchanging tariffs and metering data. For more information about ISO 15118 we refer to the publication *Exploring the Public Key Infrastructure for ISO 15118 in the EV Charging Ecosystem* by ElaadNL, which is available via: https://www.elaad.nl/uploads/files/Exploring_the_PKI_for_ISO_15118_in_the_EV_charging_ecoystem_V1.0s2.pdf.

5. Regional policies and regulations (1/2)

As already discussed in the previous chapters, a large part of the legal framework is applicable in all federal states. Thus it can be regarded as the basis for the regional implementation of (semi-) public charging infrastructure. Different local authorities are involved in the assessment of a charging infrastructure project, within the framework of a preliminary building application or a resulting (building) permission process. This is executed in accordance with specific local building regulations and/or at the discretion of the person responsible at the permitting authority.

To give some insights, this chapter provides an introduction to a few German metropolitan areas and regions.

Bavaria

E.g. The following are excerpted from laws, ordinances and regulations according to the authorities **simplified** building permitting process – building permit granted for a high-power charging (HPC) location:

- a. *Determination of jurisdiction of the building authority* according to Art. 52. II. Bayerische Bauordnung (BayBo) in conjunction with Art. 3 I. No. 1 Bayerisches Verwaltungsverfahrensgesetz (BayVwVfG)
- b. *Compliance with public-law provision* according to Art. 59 BayBO
- c. *Approval of building permit* according to Art. 68 I. No.1
- d. *Assessment (positive) according to construction planning law* § 35 Baugesetzbuch (BauGB)
- e. *Consent of municipality* according to § 36 I. No. 1 Baugesetzbuch (BauGB)
- f. *Exception to the road construction prohibition zone in agreement with the road construction authority* according to § 9 I. 1. No.1 Bundesfernstraßengesetz (FStrG) and § 9 VIII. FStrG.
- g. *Approval by the Motorway Directorate Bavaria* according to § 9 II. FStrG.
- h. *Compliance with water management interests* according to § 36 Wasserhaushaltsgesetz (WHG), Art. 20 Bayerisches Wassergesetz (BayWG) and Art. 56 I. 1. BayBO *in consideration of the official statement* SG III/1 from 08.11.2018.

5. Regional policies and regulations (2/2)

Berlin

The city of Berlin and its Senate have chosen their own way for the installation and operation of public charging infrastructure with the so-called "Berliner Modell". The infrastructure was set up in specified search areas for which a need was determined according to a location concept. In the current phase of charging infrastructure expansion, up to 700 additional charging points will be built on the basis of a proven demand. Under certain conditions, private individuals and commercial enterprises as users of electric vehicles have the opportunity to apply for charging infrastructure near their place of residence or regular workplace at www.be-emobil.de. Currently there are about 60 DC chargers and about 650 AC chargers operational within the city limits of Berlin.

Hamburg

In order to advance the expansion of the charging stations, some comprehensive analyses were carried out in the Hamburg master plan. Based on existing charging infrastructure, the various charging processes and the distribution of electric cars in Hamburg were examined. Potential areas were identified, location criteria were established and, based on these, the expansion of the network of AC charging stations and DC charging stations was worked out. In addition to legal and structural criteria, it was also analyzed how attractive the possible locations are for users and suppliers alike. Currently there are about 70 DC chargers and about 750 AC chargers operational within the city limits of Berlin.

6. Comparison German regulations with Dutch 'standards' (1/3)

Most cities and regions in the Netherlands have a policy framework and requirements for public charging infrastructure. The framework is usually based on a 'standard set' of guidelines developed in cooperation between public and private stakeholders. The standard is provided by the Netherlands Knowledge Platform for Public Charging Infrastructure (NKL) and available online via www.nklnederland.nl/kennisloket/. To compare the German and Dutch situation, these 'standard requirements' are used.

Introduction to the standard set of requirements for charging infrastructure in the Netherlands

The standard set consists of ten categories with detailed described requirements:

1. **Application and construction:** Guidelines on requesting and constructing charging stations, e.g. application portal and collision protection.
2. **Environment and location:** Agreements regarding the location of charging stations, e.g. signage and wiring.
3. **Management and monitoring:** Agreements on the maintenance and management of charging stations, e.g. the transfer of charging stations and malfunctions.
4. **Functionality:** Agreements regarding the functioning of charging stations, e.g. availability and charging sessions.
5. **Design:** Agreements regarding the design of charging stations, e.g. communication and use of materials.
6. **Engineering and safety:** Agreements regarding the technical functioning of charging stations, e.g. grounding and data connection.
7. **Back-offices and interfaces:** Agreements regarding communication between charging stations and underlying systems, e.g. communication protocols and payment options.
8. **Smart Charging and V2X:** Agreements regarding Smart Charging and advanced forms of use, e.g. support for charge profiles and return delivery of energy to the power grid.
9. **Security:** Agreements regarding the information security of charging stations, e.g. encryption and access control.
10. **Standards and requirements:** Agreements regarding the standards that must be adhered to, e.g. IEC and NEN guidelines.

6. Comparison German regulations with Dutch 'standards' (2/3)

The table below compares each category from the Dutch standard set of guidelines for charging infrastructure to similarities found in the German regulations that are in the scope of this report. Please be aware that most guidelines or regulations could be different on a local level, whereas the current status between Germany and the Netherlands is similar. I.e. each city or region has their own policies regarding public charging infrastructure. However, the German cities are used to work with their Stadtwerke for charging infrastructure, whereas the Dutch cities are used to work with Charge Point Operators directly.

Dutch category	German regulation
1. Application and construction	<ul style="list-style-type: none">• In the Dutch situation, if needed, the CPO has to apply for a grid connection in the Dutch situation. In the German Niederspannungsanschlussverordnung for each new public and private charging point an application at the CPO is needed.• On local level CPOs might have a duty to apply for a permit to install a new AC or DC charging station, which depends on local or regional regulations in the German and the Dutch situation.• On a national level, the LSV requires the CPO to inform about the installation of a new charging station, including an update immediately after a new charging station has been put into operation. There is no such regulation in the Netherlands.
2. Environment and location	<ul style="list-style-type: none">• There is no overlap between the German and Dutch regulations or guidelines. Similarities may be present in local regulations, which could be different in each city or region.
3. Management and monitoring	<ul style="list-style-type: none">• The LSV requires that documentation with the specifications of the charging station should be provided on request. This equals the guideline of BM21 in the Dutch standard set.
4. Functionality	<ul style="list-style-type: none">• There is no overlap between the German and Dutch regulations or guidelines.

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6. Comparison German regulations with Dutch 'standards' (2/3)

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Dutch category	German regulation
5. Design	<ul style="list-style-type: none">• The LSV requires that instructions for usage and payments are available in German and English, whereas the Dutch guidelines (V1) only require the Dutch language.• The Dutch guidelines (V8) and LSV both require the charge point to be equipped with Type 2 wall sockets.
6. Engineering and safety	<ul style="list-style-type: none">• There is no overlap between the German and Dutch regulations or guidelines.
7. Backoffices and interfaces	<ul style="list-style-type: none">• The Dutch Guidelines (B117) require a CPO to accept any valid charging card from an e-Mobility Service Provider for access and payment. The German LSV requires any direct payment option (i.e. a credit card, PayPal) at a charging station which is seen as optional in the Dutch guidelines (B118).• All payments and usage of the charging information (i.e. kWh, minutes) should be conform the Eichrecht in the German situation, which is usually not a standard guideline in the Netherlands.
8. Smart Charging and V2X	<ul style="list-style-type: none">• There is no overlap between the German and Dutch regulations or guidelines.
9. Security	<ul style="list-style-type: none">• There is no overlap between the German and Dutch regulations or guidelines.
10. Standards and requirements	<ul style="list-style-type: none">• The LSV requires that the public charging stations fits to DIN EN 62196, which is exactly the same as in the Dutch guideline number SN2.

7. Conclusions and recommendations (1/2)

The aim of the analysis presented in this report is to provide an understanding of the German regulations regarding charging infrastructure for electric vehicles from a Dutch perspective. This leads to the following conclusions and recommendations for Dutch companies entering the German market.

Conclusions

1. In the Netherlands, regulations are particularly laid down in tenders or local policy or local conditions. In the German situation there are local and national regulations regarding (public) charging infrastructure. For example, a national regulation such as the German LSV does not exist in the Netherlands.
2. The specific conditions from the LSV are easy to meet and are in line with the Dutch 'standards' that are used in the Netherlands. The Dutch standards are far more detailed and expanded, LSV just covers a small part of it.
3. The challenge for CPOs when installing new charging points is uncertainty about whether or not they need a permit from a municipality and the ability of local network operators to ignore an application for a charging point on public and private land. This is in contrast to the Dutch situation in which the network manager has a connection obligation.
4. The Eichrecht is the most complex condition to comply with in Germany. For AC, this is mainly due to a process that enables validated and controlled payments for the duration or charging volume. The metering is also not yet technically available at DC charging points. At the moment there is no easy solution available, but ISO 15118 is seen as a possible solution.

7. Conclusions and recommendations (2/2)

Recommendations to Dutch companies

1. The German regulations for charging infrastructure, and in particular the Eichrecht and local permits, are complex and are relatively far from Dutch practice. Involving specific expertise in this market is (almost) a prerequisite in order to make the right choices.
2. Regarding the Calibration Law and Regulations and the not entirely clear situation and the sovereignty over monitoring and enforcement of calibration within the Offices of Weights and Measures of the federal states, it would be recommended to seek early contact with the relevant authorities (Offices of Weights and Measures of the federal states, PTB and/or AGME) to discuss the individual solution.
3. The market organization in Germany differs greatly from that in the Netherlands. Stadtwerke often act as CPO and submit tenders for the placement, management and maintenance of charging points or purchasing charging points. This is in contrast to municipalities that do these tenders in the Netherlands. To be successful in the German market for charging infrastructure, make sure that your company is well informed about the local situation and market organization.

Colophon

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APPM GmbH is an independent and dedicated project management and consulting company in the field of Smart and Green Mobility, including electric mobility, charging infrastructure and cycling. Our experts support in the development and implementation of sustainable and intelligent electromobility. APPM GmbH is related to APPM Management Consultants in the Netherlands and The New Drive in Belgium.

SuMoCo – Sustainable Mobility Consulting is an independent consultancy in the German market for electric mobility and charging infrastructure in particular. SuMoCo is led by Thomas Endriß, who has around 10 years of experience in the deployment of charging infrastructure in Germany, including the complex and detailed regulations.

Appendix 1. Niederspannungsanschlussverordnung

This recently updated Low-Voltage Grid Connection Ordinance regulates, among other things, the influence of distribution network operators/distribution system operators (DNO/DSO) on the approval of new charging stations for electric cars. The amendment of the ordinance, which was drafted by the federal German government and waved through by the Bundesrat, there is still no secured claim to the installation of a charging station, be it a public charging station or a private wall box on the garage wall.

The future scenario for newly planned installations of charging infrastructure most likely will look like the following: the customer (CPO, other company or private person) additionally to other pre-announcements has to make a pre-announcement of the infrastructure project at the grid operator, then wait up to two months for the grid operator's approval before placing the order for the installation of the system. If the DNO/DSO does not respond, the customer has no means of requesting feedback.

Consequently, the DNO/DSO thus has the power to prevent any charging infrastructure project from being executed without any rationale. Therefore, German institutions (e.g. BNE) criticize the new Low-Voltage Grid Connection Ordinance.

Appendix 2. Baugesetzbuch

The Federal Building Code (Baugesetzbuch, BauGB) defines the principles and procedures to be followed by municipalities when drawing up so-called urban land-use plans. The municipalities themselves decide which types of development are permitted on which areas. However, the decision-making process is subject to fixed rules which are laid down by the BauGB and, in addition, by the "Baunutzungsverordnung".

The legislator demands municipalities to draw up so-called land use and development plans. Moreover, the BauGB does not only provide guidelines for the planning of new development areas, but also defines objectives for urban redevelopment. Specific regulations regarding charging infrastructure are not to be found in the BauGB. More specific standards governing the construction and expansion of charging infrastructure can be found regularly in the building codes of the individual federal states (Landesbauordnung, LBO) and in local building ordinances applicable to the municipality level. E.g. there are scenarios in which a single charging station is permit-free but the actual low-voltage grid connection junction box is not because it has to be located on public land, maybe even in a specially protected area in which case the local nature conservation authority and/or road authorities have to be involved in the permitting process.

If the charging infrastructure project requires a medium-voltage grid connection it can be permit-free as well but there might be the local emission control authority and/or the local fire department involved. If and when which authority gets involved is most likely in the hands of the local building permitting authority which bases its decision on their decision-making scope. A preliminary building application is always the most transparent way to go to avoid any problems with authorities during the execution phase of the charging infrastructure project.

Appendix 3. Definitions § 2. Ladensäulenverordnung

Paragraph 2 of the ordinance focuses on definitions to provide a reliable nomenclature framework for the various market participants (translation not legally binding):

1. Electric vehicle: purely battery electric vehicle or an externally rechargeable hybrid electric vehicle of categories M1 and N1 as defined in Part A of Annex II to Directive 2007/46/EC of the European Parliament and of the Council.
2. Purely battery electric vehicle is a motor vehicle with a drive system in which:
 - a. all energy converters are exclusively electrical machines;
 - b. all energy storage devices are exclusively electrically rechargeable energy storage devices.
3. Externally rechargeable hybrid electric motor vehicle with a propulsion system which has at least two different types of drive system:
 - a. Energy converters, including at least one energy converter working as an electric driving machine;
 - b. Energy storage devices, at least one of which can be electrically recharged from an energy source located outside the vehicle.
4. Energy converters are the components of the propulsion system of a motor vehicle which convert, permanently or temporarily, energy from one type into another used for the propulsion of the motor vehicle.
5. Energy storage devices are the components of the motor vehicle propulsion system which store the various forms of energy used for the locomotion of the motor vehicle.
6. A charging point is a device which is suitable and intended for charging electric vehicles and at which only one electric vehicle can be charged at a time.
7. A regular charging point is a charging point at which electricity with a maximum charging capacity of 22 kilowatts can be transmitted to an electric vehicle.
8. A fast charging point is a charging point at which electricity with a charging capacity of more than 22 kilowatts can be transmitted to an electric vehicle.
9. A publicly accessible charge point in the sense of the ordinance is located either in public road space or on private land, which can actually be accessed by an indeterminate group of individuals or a group of individuals determined only by general characteristics, can actually be driven on.
10. The construction of a charging point is its realization or conversion.
11. The regulatory authority is the Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railways.
12. The operator is who exerts decisive influence on the operation of a loading point, taking into account the legal, economic and factual circumstances
13. Selective charging is the charging of an electric vehicle which is not performed as part of a continuing obligation between the user and an electricity supply company or an operator of a charging point.