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PROCEDURES FOR THE ACTIONS REQUIRED TO BUILD ELECTRIC CAR CHARGING STATIONS AGAINST THE POLISH LEGAL FRAMEWORK

Summary. The article is an attempt to review the requirements and procedures which an investor who intends to build and commission an electric car charging station must follow. What has been highlighted is the conditions and restrictions associated with the siting of such facilities, the relevant safety requirements and the technical inspection procedures prior to the commissioning of a charging station.

Keywords: electromobility, charging station, urban planning

1. INTRODUCTION

In the recent years, one could observe certain changes in how the automotive industry has been developing towards electric cars. Despite initial scepticism, vehicle manufacturers operating all around the world started manufacturing individual electric models, while some of them have already declared significant expansion in the production of such vehicles in the years to come [1,2]. Electric cars offer numerous advantages, some of which are primarily the reduction of external costs [3-5], including those related to noise, as well as environmental costs.

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The momentum of electromobility development is determined by a number of external factors. Among them, the price barrier and the anxiety about the limited operating range of electric cars are the most topical ones [6]. With regard to the latter, special attention should be paid to the development of the charging infrastructure as well as the message sent by stakeholders. Proper promotion of electromobility may significantly contribute to the increase in the number of users of these vehicles. This is one of the main problems in focus of the research performed under the international project titled “Electric travelling – platform to support the implementation of electromobility in Smart Cities based on ICT applications (7)” implemented under the ERANET CoFund EMEurope programme co-financed, among other entities, by the National Centre for Research and Development.

The infrastructure development must proceed in line with the local legal regulations of the country concerned. With regard to charging stations, ensuring the capacity for connection to the power grid is not without significance. The article discusses selected legal requirements and procedures associated with construction of charging stations in Poland. The respective problems consecutively addressed in the paper include the following:

- additional factors to be taken into account in the process of siting of charging stations, related to land development and access to the power grid,
- requirements towards charging stations and their surroundings,
- procedures for the commencement of works,
- connection and acceptance procedures pertaining to the Distribution Network Operator and the Office of Technical Inspection.

The procedures described in the article provide the grounds for building a charging station, and then signing contracts for the station operation.

2. SITING OF CHARGING STATIONS AND ACCESS TO THE POWER GRID

One of the main problems raised in the literature of the subject with regard to the development of electromobility is the proper siting of charging stations. One can speak of a number of methods which take such factors into account as population density, coefficient of motorisation, charging station cost, distance between stations, volume of traffic streams, etc. [8-15]. However, the choice of a location is also determined by the land use. Important information that the investor must have before making the final decision to build a charging station is the intended use of the given plot of land on which construction works are to be conducted. It is established in the local land development plan, defining not only the plot's intended use, but also the conditions for land and building development, as well as the siting of public utility projects. With regard to a charging station, the land where the investment is to be implemented should be categorised as service development area, and as for the point of service connection to the power grid, it should belong to the technical infrastructure. In both these cases, there may be no exclusions, as they are formally referred to, established on such plots, preventing either the erection of a charging station or a service connection.

Another limitation is obtaining a legal title which provides for the right to perform construction works. In accordance with article 3(11) of the construction law [16], a legal title should result from the right of ownership or joint ownership, or from the right of use or perpetual usufruct. An investor can also be a lessee, provided that the lessor holding the relevant legal title to the real estate in question has authorised the other party to the agreement to perform construction works under the lease agreement.

The siting of a charging station also depends on the capacity to connect it to the power grid. In this respect, one is required to submit a request to the chosen Distribution Network Operator for determining the terms and conditions of connection to the distribution network, and upon their settlement, to sign an agreement and develop the actual connection to the network. In order to choose optimum locations for the installation of electric car charging points, both in terms of the investor's requirements and the distribution network capabilities, one is advised to contact the Distribution Network Operator in advance.

3. LEGAL REQUIREMENTS TOWARDS THE TECHNICAL DOCUMENTATION

3.1. Compliance with legal regulations

In accordance with article 13 of the act on electromobility and alternative fuels [17], charging stations should comply with the technical and operating requirements specified in particular in Polish Standards, which will ensure their safe operation, including fire safety, safe functioning of power supply systems and access to charging stations for the disabled. Detailed information on the technical requirements to be met by charging stations is provided in the Regulation of the Minister of Energy on the technical requirements for charging stations and charging points being parts of the charging infrastructure for public road transport [18]. The act in question [17] approves and defines (article 15, items 1 and 2) the procedure for obtaining an opinion on the conformity of the technical documentation of the station designed with the applicable technical requirements. Therefore, before proceeding with the construction of the charging station, one can file a request to the President of the Office of Technical Inspection for issuing upon payment an opinion on the conformity of the technical documentation of the station designed with the technical requirements specified in the act [17] (article 13) and the regulation [18] in question.

3.2. Requirements towards basic technical means of protection

The most important technical requirements are those pertaining to fire protection of the facility, as stipulated in article 5 of the said Regulation [18]. It stipulates that the equipment comprising the charging station must feature at least one of the following safeguards:

- a main switch cutting off power supply from all circuits of the facility,
- a residual-current circuit breaker in cases where the facility is powered from an AC network,
- overcurrent protection.

Moreover, in accordance with article 6 of the Regulation, the facility must be functionally based on the principle of selectivity of protection devices.

The manufacturer of the equipment admitted to the given market is obliged to guarantee the compliance of the facility with the relevant standards, and particularly with the standards harmonised with the LVD and EMC directives, as well as compliance with all the infrastructural requirements concerning, among other aspects, means of electric shock protection (both basic protection and protection in case of damage), fire protection, capacity to operate at specific temperatures or adequate ventilation.

In terms of the compliance of charging stations with Polish standards, it is recommended that the devices installed at the station meet the guidelines provided in respective industry-specific standards, such as the following:

- PN-EN 61851-1 Electric vehicle conductive charging system – Part 1: General requirements.
- PN-EN 61851-21 Electric vehicle conductive charging system – Part 21: Electric vehicle on-board charger EMC requirements for conductive connection to an AC/DC supply,
- PN-EN 61851-23:2014-11 Electric vehicle conductive charging system – Part 23: DC electric vehicle charging station,
- PN-EN 61851-24:2014-11 Electric vehicle conductive charging system – Part 24: Digital communication between a DC EV charging station and an electric vehicle for control of DC charging,
- PN-EN ISO 15118-1:2015-09 Road vehicles – Vehicle to grid communication interface – Part 1: General information and use-case definition,
- PN-EN ISO 15118-2:2016-09 Road vehicles – Vehicle to grid communication interface – Part 2: Network and application protocol requirements,
- PN-EN ISO 15118-3:2016-06 Road vehicles – Vehicle to grid communication interface – Part 3: Physical and data link layer requirements,
- PN-EN 50620:2017-07 Electric cables – Charging cables for electric vehicles,
- PN-EN 62752:2016-2 In-cable control and protection device for mode 2 charging of electric road vehicles (IC-CPD),
- PN-HD 60364-7-722 Low-voltage electrical installations – Part 7-722: Requirements for special installations or locations – Supplies for electric vehicles,
- standards of the PN-EN 62196 family, setting guidelines for sockets and plugs for electric vehicle conductive charging points,
- standards of the PN-EN ISO 15118 family, concerning vehicle to grid communication.

The building requirements towards charging stations, as stipulated in article 8 of the Regulation [18], concern protection of the facility against mechanical damage. This kind of protection should be provided by:

- siting the facility in such a way as to avoid damage caused by a vehicle running over it (equipment installed on an elevated platform), or
- using additional mechanical means of protection, such as bumpers, posts or barriers.

Furthermore, ensuring compliance with the above requirements must not hinder access to the charging point for people with disabilities (article 8(2) of the Regulation [18]).

The location of the charging station and its accessibility to users must be planned in such a way that there is no need to engage any charging cable extensions while using the facility (article 10 of the Regulation [18]).

The applicable Polish guidelines also provide for the sockets which enable charging of electric cars. In this respect, section 3 of the Regulation [18] specifies in detail the requirements to be met by vehicle sockets or connectors. Depending on the nominal power, charging points must feature either type 2 output sockets or vehicle connectors, as defined in the PN-EN 62196-2 standard [19] (for alternating current), or universal Combo 2 connectors, as per PN-EN 62196-3 [20] (for direct current).

Where any additional parking spaces are provided within the charging station, the provisions of the Regulation of the Minister of Infrastructure and Construction on technical conditions to be met by buildings and their location [21] should be followed.

In accordance with article 21, sections 1, 2 and 3 of the Regulation [21], the following minimum dimensions are defined:

a) separate parking spaces for cars:

- 2.5 m in width and 5 m in length for passenger cars,
- 3.6 m in width and 5 m in length for passenger cars used by disabled persons,
- 3.5 m in width and 8 m in length for heavy commercial vehicles,
- 4 m in width and 10 m in length for buses;

b) parking spaces arranged along the carriageway:

- 3.6 m in width, with optional reduction to 2.5 m, for cases where it is possible to use an adjacent access route or a pedestrian and vehicle route, and 6 m in length for passenger cars,
- 3.6 m in width and 6 m in length for passenger cars used by disabled persons,
- 3 m in width and 15 m in length for heavy commercial vehicles,
- 3 m in width and 19 m in length for buses.

3.3. Notification on the intend to build a charging station submitted to the architectural and construction administration body

Within the meaning of the construction law [16], building of both charging stations and charging points does not require the investor to procure a planning permission (article 29(1)(8a)). Under article 29(1)(20) [16], neither is it required in the case of construction of a power supply service connection.

In accordance with article 29a(1) [16], construction of service connections and charging stations requires a layout plan to be developed on a copy of an up-to-date master map or unit map entered into the state surveying and cartographic records.

Additionally, article 30(1) of the Regulation [16] obligates the investor to notify the architectural and construction administration body about the intent to build the service connection as well as the charging station. Depending on the station location, the competent authority is either a district governor (Polish *starosta*) or a mayor (Polish *prezydent*) in municipalities with the rights of an administrative district (Polish *powiat*), or a province governor (Polish *wojewoda*), e.g. in railway areas.

The construction law stipulates in detail what it should contain, and what other documents should be attached to such a notification of the intent to conduct construction works. In accordance with article 30(2) [16], the notification should state the type, scope and manner of performing the construction works as well as their commencement date. The notification should be accompanied with a declaration on being entitled to use the property for construction purposes, relevant sketches and drawings, as well as permits or arrangements required by separate regulations (e.g. service connection requirements, permit to occupy a roadway lane, arrangements with the competent conservation officer, if the facility is to be located within the area subject to such conservation officer's supervision). Where a service connection with the power grid is to be built, the plot or land development plan should be additionally enclosed along with a technical description of the installation. This plan must be prepared by a designer holding an adequate building license.

The notification of construction works should be submitted before the date of the intended commencement of the construction works (article 30(5) [16]). The architectural and

construction administration body may file an objection within 21 days from the date of receipt of the notification. In accordance with article 30(1a) [16], instead notifying the intent to perform construction works, the investor may submit a request for a planning permission.

As per article 41(1) [16], the construction project formally commences upon beginning preparatory works at the construction site. The preparatory works (as per article 41(2) [16]) include staking out in the field, terrain levelling, developing the required service lines or fencing of the construction site.

4. SERVICE CONNECTION AND ACCEPTANCE PROCEDURES

4.1. Notification to the Distribution Network Operator

Upon completion of the construction works, the investor is required to notify the chosen Distribution Network Operator of the readiness of the user wiring system to be connected to the power grid.

The electric vehicle charging points to be connected to the distribution network must meet the requirements provided in the relevant standards and regulations, such as those pertaining to operating safety and quality parameters, including not causing any disturbance in the power grid, etc.

When connecting fast EV charging points to the power grid, or a set of charging stations which require more capacity, it is also possible that these installations are connected to a medium-voltage network through a transformer substation owned by the investor, also referred to as an end-user transformer substation.

In accordance with the regulations in force, electric car charging points, as any other facility connected to the network, must be equipped with an appropriate measuring and billing system delivered and installed by the competent Distribution Network Operator.

4.2. Notification to the Office of Technical Inspection

Before a public charging station is commissioned and put into service, its operator is obliged to file a request to the Office of Technical Inspection for a preliminary technical inspection for operating safety of the station. The manner in which the inspection is performed is defined in the applicable Regulation of the Minister of Energy [18].

The inspection consists of checking the completeness of the documentation, verifying the compliance with the relevant requirements, visual inspections, random measurements and functional or load tests. Only equipment that has been completely assembled, which is fully operational and ready for use qualifies for the testing, which is performed by an inspector representing the Office of Technical Inspection in the presence of the operator (or a person authorised by the operator) within 30 days of the submission of a complete request for performing the tests.

In article 22, the Regulation in question [18] also lists the documents which must accompany the request for testing:

- a) technical description of the facility:
 - name, address, telephone number and e-mail address of the operator;
 - information whether the facility is a charging station, a public charging station or a charging point being a part of the public road transport charging infrastructure;

- technical details of the facility: type, factory number, number of charging points within the charging station;
- electrical input parameters: input power, mains voltage, and mains system, if applicable;
- electrical output parameters: ranges and types of output voltages for individual charging points, maximum charging currents for individual charging points, IP protection of the facility;
- facility dimensions:
 - height above the ground level at which the user interface has been installed, if present;
 - connector type for each charging point;
 - ambient temperature range within which the facility can be operated;
 - station's longitude and latitude as per the WGS84 system;
- b) a declaration of conformity, as referred to in article 5(10) of the act of 30 August 2002 on the conformity assessment system [22], i.e. a declaration by the manufacturer or their authorised representative stating to their sole responsibility that the given product complies with the relevant essential requirements;
- c) operating instructions in Polish provided by the manufacturer of the facility equipment or their authorised representative;
- d) a certificate of correct installation, as per a template provided in the annex to the Regulation;
- e) records of electrical measurements approved by a person qualified to perform duties of an supervision inspector, referred to in the regulations issued pursuant to article 54(6) of the energy law [23] along with a copy of the qualification certificate held by the person in question, certified by the same person for conformity with the original;
- f) a drawing along with a description of the place where the facility has been installed, showing in particular its location against areas of road traffic, pedestrian traffic, vehicle charging stations, explosion hazard zones, as well as a description of the measures applied to protect the facility against mechanical damage and of the rainwater drainage method;
- g) a diagram of the facility's power supply system, indicating in particular the charging point equipment enabling the vehicle to be connected to the charging point and feeding the connected vehicle with energy (power supply equipment), the size and type of safeguards, as well as the type and category of power supply lines;
- h) a copy of the technical acceptance protocol for the installation or the power supply service connection;
- i) an opinion on meeting the relevant fire protection requirements, issued by a fire protection expert.

5. CONCLUSION

Full implementation of electromobility requires actions integrated on many levels of the transport systems currently in operation. The efforts undertaken so far by the manufacturers of electric cars, aimed to extend the distance they can cover on single charging, have recently been substituted by their urge to design urban cars that can be recharged as quickly as possible. In light of the insufficient charging infrastructure, this constitutes a clear barrier hampering the development of electromobility in Poland. The procedures discussed in the article are envisaged to allow for the formal requirements pertaining to construction of electric car charging stations to be fulfilled. It should be noted that with regard to charging stations 2020 will be a particularly important year for Poland, since the act on electromobility and

alternative fuels [17] imposes an obligation on municipalities to prepare plans for the construction of charging stations, followed by their actual installation and commissioning in a specific minimum number by 31 December 2020.

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