



Economic Commission for Europe**Inland Transport Committee****Working Party on Transport Statistics****Seventy-fourth session**

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Item 4 of the provisional agenda

Electric vehicle charging statistics**Considering Definitions for Electric Vehicle Charging Infrastructure Statistics****Note by the secretariat***Summary*

This document discusses Electric Vehicle Charging Infrastructure definitions for the Working Party to consider and suggest improvements to. It describes the results of a survey conducted on ECE member States in Autumn 2022, as well as existing definitions used by the European Alternative Fuels Observatory managed by the European Commission and makes some commentary on this. As the market is currently evolving quickly, it may be the case that rigid definitions will not be agreed upon immediately. Any agreed upon definitions can be considered for future updates of the Glossary for Transport Statistics.

I. Background

1. With transport making up 22% of all energy-related greenhouse gas emissions, it is a crucial sector to decarbonize in order to meet the Paris agreement and limit temperature rises to 1.5°C. Electrification of vehicle fleets is, along with modal shift to less polluting modes, an important tool to align transport with a climate neutral future where the Sustainable Development Goals are achieved. UNECE countries are already making progress towards electrification. Fifteen UNECE countries with available data have new registrations of plug-in passenger cars as 5% or more of total passenger car registrations in 2020, with this figure as high as 70% in Norway (data coming from the Common Questionnaire).

2. Countries across the region are expected to make even stronger progress towards electrification in the coming years, especially given that most UNECE member States have made pledges and commitments to zero tailpipe emission vehicles in the coming decades. But a potential barrier to mass adoption remains (actual or feared) range anxiety, where the lack of publicly accessible chargers (and their speed) is seen as a concern, particularly on ad-hoc or occasional journeys (as homes and workplaces often do have, or have the potential to add, charging facilities available). Therefore, understanding how different countries are

progressing in the provision of public charging infrastructure is of public policy interest, which means that official statistics in this domain can provide significant added value. In policy areas of low maturity but high potential to reach many citizens, like electric vehicle charging infrastructure, the development of official statistics can aid the public debate. For example, in countries where electric vehicle charging infrastructure statistics have been in wide public use for the longest time, a wide range of public, private and third sector bodies have been able to debate the insights that high quality statistics can deliver, as opposed to simply debating the number or amount of infrastructure itself. This moves the debate from questions of “what is the number of devices/points that exist?” to questions of “what is the appropriate amount of devices/points to achieve a successful transition to electric vehicle technology?”. In countries where the most open, appropriately parameterized, data are published (e.g. number of charge points by local government area), those data can be matched to a range of other data to enhance the debate further, as has been seen in the UK when the Department for Transport’s official statistics were matched to separate tourism statistics by a third party, and then discussed in the media¹. For official statistics to be comparable across countries, internationally agreed-upon definitions are necessary. Specifically, open questions include:

- What to count in this field? Should it be locations/stations/pools, devices, connectors or points?
- How is a “public” charging station defined?
- What categories should be used for different speeds of chargers?
- Should the geolocations of the chargers be collected (particularly important given the importance of proximity to the road network when considering convenience of charging), or at least the type of charging location (i.e. service station, on-street or destination)?
- How are the data collated? Do they come from business statistics, surveys, or collaboration with industry for example?

3. The major existing international data collection on this topic (that the secretariat is aware of) is conducted by the European Alternative Fuels Observatory (EAFO), part of the European Commission Directorate-General for Mobility (DG-MOVE). In addition, certain private sector data are available in many countries. It is believed that more coordination on definitions and methodology in this domain would be of benefit to all producers and users of statistics.

II. Survey of countries

4. In light of this situation, the secretariat together with Eurostat and the International Transport Forum sent out to member States a survey on existing statistics on the topic, how data were collected and what definitions were used. The survey, which closed in December 2022, garnered 25 responses. All relevant responses obtained from countries are listed in the Annex.

5. The results of the survey in general show that many statistical offices are indeed monitoring, or are considering starting to monitor, electric vehicle charging infrastructure, and the wide range of definitions used does indeed show that international standards would be of benefit. The rest of this section discusses their responses to specific questions.

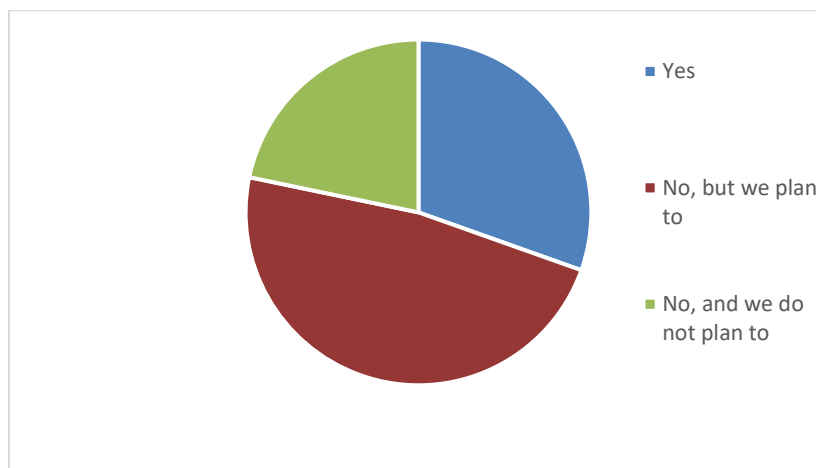
Status of Existing statistics

6. Firstly, seven countries (Belgium, Hungary, Italy, Norway, Slovakia, Switzerland and United Kingdom) indicated that they are already producing statistics on the topic. In addition, twelve other countries (Croatia, Czechia, Iceland, Ireland, Israel, Latvia, Malta, Netherlands,

¹ <https://www.theguardian.com/environment/2023/feb/18/taking-tesla-to-truro-warnings-lack-of-electric-charging-points>.

Poland, Portugal, Spain and Sweden) said that they do not currently collect data but are planning to in the future. Six countries indicated that there were no plans for official statistics on the topic (see figure 1).

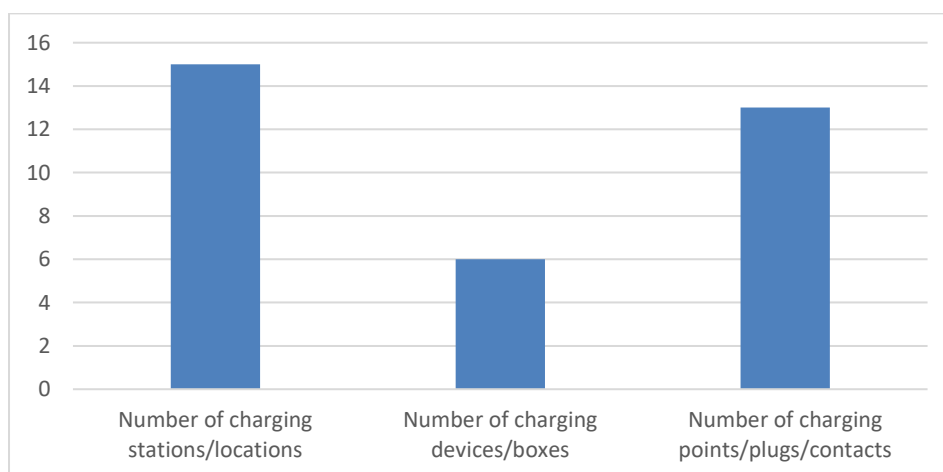
Figure 1
Status of countries' data collection on electric vehicle charging infrastructure



What to Count?

7. After this, fifteen countries indicated that charging “stations” or locations were counted (or would be counted). Six countries indicated that charging devices or boxes were counted; thirteen countries indicated that points/contacts or plugs were counted or would be counted (figure 2).

Figure 2
Charging infrastructure items counted by countries



How to define public?

8. A wide range of answers were given in terms of how to define what charging infrastructure should be considered public. The following list attempts to broadly classify how different countries define public but given the complexities in each country response the original answers in the annex should be consulted.

Everything that is not a household:	Bulgaria
Publicly accessible 24/7 by anyone:	Belgium, Sweden, Switzerland, Malta ²

² Malta specifies that whether parking is free or charged does not change this distinction.

Non-discriminatory access:	Czechia, Hungary, Iceland, Ireland, Latvia, Slovakia, Spain
State-owned electric power provider:	Liechtenstein
Lists included locations explicitly:	United Kingdom

Charging thresholds

9. A wide range of answers were given on charging thresholds. Many (but not all) countries mention that the differences between Alternating Current (AC) and Direct Current (DC) is collected (some vehicles are only designed to use one type, but adaptors exist.) DC chargers are typically faster than AC chargers. Not many countries responded with concrete thresholds. Switzerland suggested, for example, that their thresholds are <10 kW, 10-21 kW, 21-42 kW, 42-100 kW, 100kW+. Some European countries mentioned the European thresholds (see EAFO definitions below).

Electricity consumption of charging stations

10. In addition to counting of the infrastructure, a question also asked if statistical offices were monitoring electricity consumption of charging stations. Three countries indicated that they were. In addition, three countries mentioned that the pricing of stations was being monitored. Finally, the survey included an option to mention any other data collected in this domain. Countries mentioned that type of charger (presumably AC/DC or the plug type), electricity used by the cars is calculated from vehicle mileage and standard vehicle electricity consumption; and one country (the United Kingdom) mentioned that the number of devices specifically funded through government grants is collected in addition.

Data collection

11. The information on how data are collected showed a wide range of strategies across countries. Belgium, Czechia and Spain said that they have or will have a contractual arrangement with charging station operators in place, to mandate data collection. Latvia also said data were based on a legal obligation, that is based on European Union law³ (which will be an approach that other European Union members emulate).

12. An alternative source to the charging operators themselves is the electricity authority. Hungary, Ireland, Liechtenstein, Malta, Slovenia and United States indicated that data were (or would be) coming from the electricity companies or authorities directly, or from Ministries of energy (which presumably obtain them from the electricity company/authority).

13. Norway, Poland, Slovakia, Sweden, Switzerland and the United Kingdom report that an industry association is or will be providing the data (either through formal agreements or goodwill).

14. Exceptionally, Italy mentions that data are collected through a Computer Assisted Web Interview-based survey of municipalities/provinces.

Geospatial locations

15. Czechia, Liechtenstein, Malta, Netherlands, Poland, Portugal and Republic of Moldova do not collect any geospatial coordinates or information on the type of public charging place (supermarket etc). The United Kingdom collects location type, as well as the distinction between “on-street” residential chargers, “destination” chargers at restaurants etc., and “en-route” chargers at e.g. motorway service stations. Eleven countries (Bulgaria, Croatia, Hungary, Ireland, Israel, Norway, Slovakia, Spain, Sweden, Switzerland and the

³ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0559&qid=1666765612202>.

United States of America) collect the coordinates of these locations, while four countries (Belgium, Croatia, Iceland and Latvia) collect both location type and coordinates.

III. Existing International Data and Standards

16. As mentioned above, the principal source of existing data in Europe on public charging infrastructure is the EAFO. Their site contains up-to-date data (on a monthly basis for some series) as well as the following definitions⁴. It should be noted that these definitions may be subject to a revision due to new legislation of the European Union expected to be finalized in 2023.

Recharging Pool

17. A recharging pool consists of one or multiple recharging stations and the accommodating parking lots. The recharging pool is operated by one charge point operator (CPO) at one location/address and GPS coordinates. The recharging pool is an object relevant for “cartographic view”, guiding tools and all features that represent a recharging infrastructure element on a map. A recharging pool is defined by: One location/address and GPS coordinates; One charge point operator.

Recharging Station / Recharging Pole / Recharging Dock / Electric Vehicle Charging Station (EVCS)

18. A Recharging Station is a physical object with one or more recharging points, sharing a common user identification interface. All the physical “human-machine” interfaces are located at the recharging station. Some recharging stations have a badge / RFID reader, buttons, displays, LEDs. Other stations are ‘Plug & Charge’, without buttons, display, etc. In those cases, a vehicle is automatically identified. A recharging station is defined by: One physical object; One user interface.

Recharging Point / Recharging Position / Electric Vehicle Supply Equipment (EVSE)

19. The electric energy is delivered through a recharging point. A recharging point may have one or several connectors (outlets or plugs) to accommodate different connector types. Only one can be used at the same time. A recharging point is defined by: Recharging one vehicle at a time. In other words: per recharging station the number of recharging points and (dedicated) parking spots are equal.

Connector

20. A connector is the physical interface between the recharging station and the electric vehicle through which the electric energy is delivered. This can be a plug on a cable, a plug on an inseparable cable of the recharging station, an induction plate or a pantograph. Usually, the number of recharging points and the number of connectors is equal, but not always. For example, there are recharging stations consisting of 2 recharging points and 3 connectors. In that case not more than 2 connectors can be used, no more than 2 vehicles can be charged at a time (one AC and the other DC).

⁴ Taken from <https://alternative-fuels-observatory.ec.europa.eu/general-information/recharging-systems> in February 2023.

Public and semi-public

21. The EAFO collects data only on publicly accessible recharging points. In accordance with Article 2(38) and recital (17) of proposed AFIR regulation⁵, this comprises “infrastructure which is located at a site or premise that is open to the general public, irrespective of whether the alternative fuels infrastructure is located on public or on private property, whether limitations or conditions apply in terms of access to the site or premise and irrespective of the applicable use conditions of the alternative fuels infrastructure”. A recharging point located on a private property that is accessible to the general public should be considered as publicly accessible also in cases where access is restricted to a certain general group of users, for example to clients. This includes, for instance, also recharging points at supermarkets and parking lots of convenience stores. However, recharging points located on private properties, access to which is restricted to a limited, determinate circle of persons, such as parking lots in office buildings to which only employees or authorised persons have access, should not be considered as publicly accessible recharging points and EAFO therefore currently does not gather any data on these. Data are

Charging thresholds

22. EAFO proposes the following power categorization:

AC	$P < 7.4 \text{ kW}$
AC	$7.4 \text{ kW} \leq P \leq 22 \text{ kW}$
AC	$P > 22 \text{ kW}$
DC	$P < 50 \text{ kW}$
DC	$50 \text{ kW} \leq P < 150 \text{ kW}$
DC	$150 \text{ kW} \leq P < 350 \text{ kW}$
DC	$P \geq 350 \text{ kW}$

IV. Comments from the Secretariat

23. Both the survey and the approach of EAFO show that in terms of what to count, “pools/stations”, i.e. geographic locations, as well as recharging points seem the most useful for statistical purposes. The former can give a sense of the extent of the network and number of available locations, while the latter is more useful for considering the capacity of charging available nationally to travelers (compared to the number of connectors/plugs, which do not give an indication of total capacity.)

24. In terms of what constitutes a public charger, there seems to be some ambiguity over “semi-public” charging that better definitions could try to minimize. Questions may arise as to where to draw the line when car parking charges, regular restrictions on the equipment due to certain events, or requirements to be a customer of the business may limit access. Additionally, whether semi-public chargers should be generally included as public infrastructure should be discussed (according to the forthcoming legislation in the European Union, they will be considered in the category of publicly accessible charging points).

25. EAFO data collection makes the distinction between AC and DC. While DC chargers are typically more powerful, it is possible for a charger of e.g. 50kW to be either AC or DC and this does not affect charging speed. Therefore, it may be easier to ignore this distinction in statistical definitions, although the distinction could be of use for users. In addition, it is also likely that charging speeds will improve in the future as technology develops, and so terms like “fast”, “rapid”, “ultra-rapid” etc. are possibly not useful over time.

26. One possible issue with the above is the overlap between fast AC chargers and slower DC chargers. But if DC chargers that are less than 50kW are typically higher than 40 kW, and AC chargers greater than 22kW are typically less than 35 kW (for example), then there is less chance for confusion.

⁵ <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52021PC0559>.

27. An additional consideration would be to look into types of location, as done by the United Kingdom and others. A proposal on type of location definitions is not currently proposed but can be considered based on the desires of member States. This could follow the approach of the United Kingdom (distinguishing between on-street, en-route and destination chargers, or going into more detail on the location (service station, hotel etc.)

28. Going further, it is also worth considering additional areas of statistics on charging infrastructure that may need to be addressed in the future. For example, the number of private charging points, the electricity consumed for these purposes as well as the times of peak demand, and charging infrastructure that is focused on heavy vehicles may soon require international statistics focus.

29. The secretariat stands ready to facilitate discussions around these topics to maximise the comparability of international data.

Annex

Country and organization definitions

A charging station/pool is:

Czechia	According to national legislation on fuels, an operator of publicly accessible recharging stations has an obligation to make a registration at Ministry of Industry and Trade. Our statistics are therefore based on that registration obligation.
Hungary	A charging station is an area containing at least two charging devices.
Ireland	A charging station can be defined as the area in which charging points are located.
Norway	A charging station is a place with one or more charging points, i.e. a contact with a parking space reserved for electric cars or rechargeable hybrids.
Sweden (from nobil.no)	A charging station is a place / location where there is one or more charging points.
AFIR	'Recharging pool' means one or more recharging stations at a specific location.

A charging device/station is:

Hungary	Electrical equipment that has at least one normal or high-power charging point.
Ireland	A charging device can then be defined as an accessible piece of equipment whose sole purpose is to supply an electric charge to an electric vehicle through the transfer of electricity (through cables/connectors) from an electrical supply to the vehicle.
Latvia	2014/94/EU states: 'recharging point' means an interface that is capable of charging one electric vehicle at a time or exchanging a battery of one electric vehicle at a time. Agrees with EAFO.
Slovakia	Quotes the AFIR ⁶ regulation, agreeing with EAFO.
United Kingdom	A charging device is a unit capable of charging the batteries of plug-in electric vehicles. Devices are classified by their power output, and each device may offer one or more connecting points. The term 'chargepoint' is also sometimes used, including in previous statistical publications from DfT. This may refer to either a single device or a number of connectors on a device which can be used simultaneously. For the grant schemes, we collate data from mainly internal sources and sum the number of devices or sockets by the breakdowns we publish by. https://www.gov.uk/government/statistics/electric-vehicle-charging-device-grant-scheme-statistics-july-2022
EAFO	'Recharging station' means a single physical installation at a specific location, consisting of one or more recharging points.

A charging point is:

Belgium	Charging point: a connection with which an electric vehicle can be charged or with which the battery of an electric vehicle can be replaced.
Hungary	electric charging point: the charging connector on the electric charging device, which is suitable for charging the electricity storage system of only one electric vehicle.
Liechtenstein	Definition used by LKW elec company.
Spain	Electric Vehicle Supply Equipment (EVSE) "considered as an independently operated and managed part of a Charge Point that can deliver energy to one Electric Vehicle at a time."
Sweden	(links to https://info.nobil.no/index.php/nyheter/89) A charging point is a reserved parking space with a charging option for rechargeable vehicles. At one charging point there can be more than one contact, but only room for one vehicle at a time.
AFIR	'recharging point' means a fixed or mobile interface that allows for the transfer of electricity to an electric vehicle, which, whilst it may have one or several connectors to accommodate different connector types, is capable of recharging only one electric vehicle at a time, and excludes devices with a power output less than or equal to 3,7 kW the primary purpose of which is not recharging electric vehicles.

⁶ <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52021PC0559>.

What is *public charging*?

Belgium	A charging point for normal or high power that provides access to users of electric vehicles on a non-discriminatory basis every day of the week and twenty-four hours a day, regardless of the concrete method of authentication, use and payment.
Bulgaria	Excluding private homes.
Czechia	We use quite vague definition in Directive 2014/94/EU on deployment of infrastructure for alternative fuels.
Hungary	Electric charging equipment operated on public land, next to a public institution building and in public institution customer parking lots, as well as at public fuel filling stations, which is accessible without discrimination under the identification, use and payment conditions defined for electromobility users, as well as electric charging equipment operated on private land or public parking lots open to public traffic, which is accessible to a limited range of electromobility users without payment or under specific payment conditions, including coastal electricity supply, excluding electric charging equipment operated in households.
Iceland	If person is able to park beside charging station and plug the car in it and charge it.
Ireland	Public charging points can be defined as a charging point which is readily accessible for all members of the public. Access to the charging point is not limited to certain residents/users. Public charging stations can be typically found at service stations, shopping centres and public parking areas, all of which are accessible to all members of the public.
Latvia (from EU regulation 2014)	Quotes AFIR (agreeing with EAFO).
Liechtenstein	The state-owned electric power provider.
Malta	Refers to an individual or a group of connectors that can charge an EV at /Infrastructure: any given time. A public charging point is any charging point/infrastructure associated to a parking space which is physically accessible to the public, including those within commercial, industrial or private car parks accessible to the public, irrespective of whether access to parking is free of charge or against a payment.
Poland	So far we know about, it's impossible to track private charging stations. With the help of certain institutions and offices, you can estimate the number of private charging stations. But we won't be able to check it until next year.
Sweden (from mobil-no)	The number of charging points that are at charging stations that are available to everyone or visitors. For the latter, it is assumed that you have an errand on site (e.g. shopping centre, office building, schools and other public institutions).
Switzerland	Public accessible.
Slovakia	For the definition, please refer to EU Alternative Fuel Infrastructure Regulation ⁷ ("which is located at a site or premise that is open to the general public, irrespective of whether the alternative fuels infrastructure is located on public or on private property, whether limitations or conditions apply in terms of access to the site or premise and irrespective of the applicable use conditions of the alternative fuels infrastructure.")
Spain	AFIR Directive (see Slovakia)
United Kingdom	We have a publication dedicated solely to public charging, whilst grant schemes is not all public.
AFIR	Infrastructure which is located at a site or premise that is open to the general public, irrespective of whether the alternative fuels infrastructure is located on public or on private property, whether limitations or conditions apply in terms of access to the site or premise and irrespective of the applicable use conditions of the alternative fuels infrastructure."

What speed thresholds?

Belgium	Charging point for normal power: a charging point with a capacity not exceeding 22 kW (kilowatts) with which electricity can be transferred to an electric vehicle, with the exception of facilities with a capacity not exceeding 3.7 kW that are installed in private households or of which the main purpose is not to charge electric vehicles, which are not accessible to the public and
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⁷ <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52021PC0559>.

	<p>which are equipped with type 2 sockets or vehicle connectors, as specified in standard EN62196-2 of the International Electrotechnical Commission.</p> <p>10° high power charging point: a charging point with a capacity of more than 22 kW that can be used to transfer electricity to an electric vehicle.</p> <p>High power alternating current (AC) charging stations for electric vehicles are equipped with at least type 2 connectors for interoperability, as specified in standard EN62196-2.</p> <p>High power direct current (DC) charging stations for electric vehicles shall, for reasons of interoperability, at least be equipped with connectors of the Combo 2 type AC/DC combined charging system as specified in International Electrotechnical Commission standard EN62196-3.</p>
Croatia	Data on the type of chargers by power, voltage and type of electricity will be available.
Czechia	In our data collection we distinguish between normal power recharging point (recharging points with power less than or equal to 22 kW) and high-power recharging point. Classification is in compliance with Directive 2014/94/EU. For the future further classification according to requirement of AFIR proposal.
Hungary	We are collecting data regarding the count of charging and the amount charged in AC/DC grouping. We also collect the number and capacity of each device's connection point.
Iceland	Yes, data are available about the plug types and size of the stations in KW.
Ireland	<p>The aim of upcoming data collection will be to classify charging points by the charging speed. The speed of the charging point will be determined by its power output. The strength of the power output will affect the duration of required charging time. There are four main charging types:</p> <ol style="list-style-type: none"> 1. Slow (3kW – 6kW) – Type 2 AC Socket 2. Standard (7kW – 22kW) - Type 2 AC Socket 3. Fast (23kW – 99kW) – Type 2 AC Socket/ CHAdeMO DC/ Combo DC/ CCS DC 4. Rapid (100kW+) – CCS DC / CHAdeMO DC.
Latvia (from EU directive)	<p>‘normal power recharging point’ means a recharging point that allows for a transfer of electricity to an electric vehicle with a power less than or equal to 22 kW, excluding devices with a power less than or equal to 3.7 kW, which are installed in private households or the primary purpose of which is not recharging electric vehicles, and which are not accessible to the public; high power recharging point’ means a recharging point that allows for a transfer of electricity to an electric vehicle with a power of more than 22 kW;</p> <p>Such data is indirectly reflected in the claimed power outlet for the charging socket (kW). The object's status distinction of slow/fast/superfast etc. is not used so far but might be added to data set later.</p>
Liechtenstein	<p>3 types of charging stations:</p> <ol style="list-style-type: none"> 1 = CCS Type 2, max. 50 kw 2 = CHAdeMO, max. 50 kw 3 = Type 2, max. 43 kw.
Norway	Statistics Norway has access to private data which cover the speed of charging. Our published data does not differentiate between the varying charging power of charging points.
Slovakia	We distinguish between AC and DC + charging power (e.g. 11 kW, 50 kW, 150+ kW).
Slovenia (Statistical Office of the Republic of Slovenia)	Within the competence of the Ministry.
Spain	The application the Ministry is working on will cover information of power and type of connector, so it will be possible to know the speed of charging and differentiate between fast and ultra-fast charging points.
Sweden	(from nobil.no) Charging stations semi/fast: This is the number of locations where there are charging outlets with a capacity of at least 22 kW.
Switzerland	<p><10kw</p> <p>10-21kW</p> <p>21-42kW</p> <p>42-100kW</p> <p>>100kW</p>
United States	Yes. EV Level 1 (Home), EV Level 2 (public slow charger), EV Fast (Direct Current Fast Charger)

United Kingdom	<p>Yes. We categorise as the following: Charging device speed definition, kilowatts</p> <p>Rapid charging or above devices are those whose fastest connector is rated at 25kW and above and includes charge points classified as either rapid or ultra-rapid.</p> <p>Slow Charging Devices represents 3 kilowatts (kW) to 6 kW.</p> <p>Fast Charging Devices represents 7kW to 22kW.</p> <p>Rapid Charging Devices represents 25kW to 100kW.</p> <p>Ultra Rapid Charging Devices represents 100kW plus.</p>
AFIR	<p>Slow AC recharging: $P < 7.4 \text{ kW}$.</p> <p>Medium-speed AC recharging $7.4 \text{ kW} \leq P \leq 22 \text{ kW}$.</p> <p>Fast AC recharging $P > 22 \text{ kW}$.</p> <p>Slow DC recharging point: $P < 50 \text{ kW}$</p> <p>Fast DC recharging point: $50 \text{ kW} \leq P < 150 \text{ kW}$</p> <p>Level 1 - Ultra-fast DC recharging point $150 \text{ kW} \leq P < 350 \text{ kW}$</p> <p>Level 2 - Ultra-fast DC recharging point $P \geq 350 \text{ kW}$</p> <p>In parallel the terms “normal power” for AC points less than 22kW; and “high power” for AC stations above 22kW and all DC points; are used.</p>