Joint Office of Energy and Transportation

Electric Vehicle Charging Analytics and Reporting Tool (EV-ChART)

Data Format and Preparation Guidance
Version 2.0

Download the EV-ChART Data Input Template on DriveElectric.gov:

https://driveelectric.gov/files/ev-chart-data-input-template.xlsx

Errata

This report, originally published in May 2023, was revised in August 2023 and then October 2023 to update the following:

- Unit of measurement for uptime calculation and outage from hours to minutes, so it is consistent with 23 CFR 680.

- Revised guidance under "Data Submission Frequency."

- In Table 2, Port ID data submission frequency is now quarterly, Project ID submission frequency varies. The field name is now "equipment_acq_date" for Charging Equipment Acquisition Date.

- Updated Table 3 information and "Session Error" examples.

- Revised "DER Asset Type" from a recommended to a required field, and "DER Asset Type Description" from required to recommended.

List of Acronyms

DER	distributed energy resource
EV	electric vehicle
EV-ChART	Electric Vehicle Charging Analytics and Reporting Tool
EVSE	electric vehicle supply equipment
NEVI	National Electric Vehicle Infrastructure
USPS	U.S. Postal Service

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Introduction

Background

The Joint Office of Energy and Transportation maintains the Electric Vehicle Charging Analytics and Reporting Tool (EV-ChART), which provides a centralized hub for submitting electric vehicle (EV) charging infrastructure data directed by the Federal Highway Administration (23 CFR 680.112[1]) EV-ChART will provide a streamlined data submission process and an integrated set of analytic tools, connect to other data sources, and empower data sharing and access across stakeholders, including the public. Any data shared publicly will be aggregated and anonymized to stay in accordance with 23 CFR 680.

This *EV-ChART Data Format and Preparation Guidance* provides a comprehensive overview of the data reporting requirements as authorized under 23 CFR 680.112. The guidance is intended to be used alongside the *EV-ChART Data Input Template*, which defines the tabular data structure that these data submissions must follow.

Per 23 CFR 680.112, the annual and quarterly data submissions are required of all National Electric Vehicle Infrastructure (NEVI) Formula Program projects, as well as projects for the construction of publicly accessible EV chargers that are funded with funds made available under Title 23, United States Code, including any EV charging infrastructure project funded with federal funds that is treated as a project on a Federal-aid highway. One-time data submissions are required of both the NEVI Formula Program projects and grants awarded under 23 U.S.C. 151(f) for projects that are for EV charging stations located along and designed to serve the users of designated Alternative Fuel Corridors. Other information and data required in 23 CFR 680, such as 23 CFR 680.112(d), 23 CFR 680.116(c), 23 CFR 680.106(a), are not discussed in this guidance.

Scope of Data

EV-ChART is the prescribed source of data for 23 CFR 680.112(a)–(c). Quarterly, annual, and one-time data submittal will provide vitally important feedback that is necessary to monitor, measure, and improve EV charging infrastructure among the broader federal, state, and local policy decisions. EV-ChART data can be used to assess the following metrics:

- **Reliability:** A February 2023 J.D. Power report surveyed 26,500 charging attempts at Level 2 and DC fast chargers in all 50 states and found that drivers cannot reliably charge at public charging stations, with the rate of failure increasing from 15% in the first quarter of 2021 to over 21% by the fourth quarter

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[1] Federal Highway Administration. 2022. "National Electric Vehicle Infrastructure Standards and Requirements." *Federal Registe*r, 23 CFR 680. https://www.federalregister.gov/documents/2022/06/22/2022-12704/national-electric-vehicle-infrastructure-formula-program

of 2022.[2] The Federal Highway Administration aims to address this reliability issue in part by requiring minimum uptime (23 CFR 680.116(b)) and requiring data for duration of outage and error codes associated with an unsuccessful charging session (23 CFR 680.112(a)).

- **Future planning and policy:** EV-ChART will help state, federal, and local/municipal government departments of transportation improve siting and upgrading decisions by providing charging session level data (23 CFR 680.112(a)). This will be invaluable in determining how congested charging stations are and will help stakeholders understand what operational decisions or network functionality contributed to optimal utilization levels. Additionally, maintenance and repair cost (23 CFR 680.112(b)(1)) will provide state, federal, and local governments a better understanding of the costs associated with installation, maintenance, and operation, which will inform EV charging program design.
- **Grid impact:** Collecting data on peak energy per session (23 CFR 680.112(a)(5)), distributed energy resource (DER) installed capacity (23 CFR 680.112(c)(2)), and DER acquisition and installation cost (23 CFR 680.112(c)(3)) will improve understanding on the impact of EV charging on the grid. This will help electric utilities, state public utility commissions, independent system operators, regional transmission organizations, and other state and federal agencies set policy, plan grid upgrades, and improve the process for siting and connecting future charging stations to the grid.
- **Equity:** Providing state departments of transportation with information to track and achieve their equity goals will inform workforce development initiatives and other federal, state, and local policies aimed at creating a vibrant, competitive market and new jobs.

Instructions

Data submissions to EV-ChART must follow the reporting standards outlined in this guidance and follow the format of the accompanying *EV-ChART Data Input Template*. Acceptable file format extensions, file sizes, and submission methods will be determined and published later.

The required data are organized into nine modules, which are represented as different tabs in the *EV-ChART Data Input Template*. Each data attribute, represented as a column, in a single row of a module must be submitted together. In other words, when submitting a row of data, every column within that row must have a value (exceptions are recommended fields).

The first tab in the input template, "Data_Dictionary," provides an overview of the data fields for each module and its data submission frequency (minimum required cadence of data submission per 23 CFR 680.112(a)–(c)). Each data field or row contains:

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[2] Hannah Lutz. 2023. "EV drivers struggle with declining reliability of charging network." *Automotive News*, Feb. 8, 2023. https://www.autonews.com/mobility-report/ev-drivers-struggle-declining-reliability-charging-network

- **Data attribute:** Human-readable form that identifies the field.
- **Field name:** Computer-readable form that identifies the field.
- **Definition:** Definition of the field.
- **Accepted values:** The [format/type](#) for each data field, with examples.
- **Reporting:** Specifies whether the data field is required per 23 CFR 680.112(a)-(c) or recommended. A recommended field is information that has been deemed pertinent but not required. Submission of recommended fields is encouraged to allow additional evaluation and analysis.
- **Constraint:** Notes whether the field is a primary key.

Users should implement the following steps when preparing and submitting data:

1. Review the definition of each data attribute, their accepted values, and units of observation. This information can be found in this manual or in the "Data_Dictionary" tab of the input template. Where applicable, corresponding fields in OCPI 2.2.1 are noted for reference.

2. Select the correct Data Module (1–9) tab to populate data.

3. Input a value for each data attribute (i.e., each column in the module) per the definitions and value constraints specified.

4. Ensure that each row reported in the chosen module is uniquely identified by its primary key(s) and every cell within a row has a value (exceptions are for recommended fields). Attributes that have "recommended" reporting should be submitted concurrently with the required data attributes found in the same module.

5. Modules should be submitted at a minimum cadence specified in 23 CFR 680.112(a)–(c). Modules may be submitted at a greater frequency than required.

Data Reporting Guidelines

Data Types

String or String(X)

Alphanumeric entries with no maximum character count when *X* is not defined or with a maximum length of *X* when *X* is defined.

DateTime

The date and time reported as YYYY-MM-DD HH:MM:SS reported in UTC.

Decimal(X,Y)

Numeric values with a maximum number of (*X*) digits permitted and a length of (*Y*) decimal places required.

Boolean

Either the word "TRUE" or "FALSE" reported as a string.

Integer

Numeric value greater than or equal to zero and specified to the nearest whole number. No maximum value when *X* is not defined or with a maximum number of *X* digits when *X* is defined.

Data Submission Frequency

One-Time

As required by 23 CFR 680.112(c), beginning March 1, 2024, data with a "One-Time" data submission frequency must be collected and submitted a minimum of once for each charging station.

Note: This data frequency applies only to the NEVI Formula Program projects and grants awarded under 23 U.S.C. 151(f) for projects that are for EV charging stations located along and designed to serve the users of designated Alternative Fuel Corridors.

Data Collection Timeline:

States or other direct recipients must submit one-time data—or approve data pre-submitted by their subrecipients and contractors—by March 1 of the current year for stations that became operational in the preceding year. We encourage one-time data to be submitted as soon as the data are available, and modules can be submitted independently. For example, a station that becomes operational any time during the 2023 calendar year may submit one-time data any time in 2023, but all one-time modules must be submitted or approved by the direct recipient no later than March 1, 2024.

Annual

As required by 23 CFR 680.112(b), beginning in 2024, data with a submission frequency of "annual" are submitted, at a minimum, on an annual basis, on or before March 1.

Data Collection Timeline:

States or other direct recipients must submit annual data—or approve data pre-submitted by their subrecipients and contractors—by March 1 of the current year for stations that became operational in the preceding year. We encourage annual data to be submitted as soon as the data is available (i.e., modules can be submitted independently). For stations that became operational any time during the 2023 calendar year, all annual modules must be submitted or approved no later than March 1, 2024.

Quarterly

Recipients must ensure data with a submission frequency of "quarterly" are submitted, at a minimum, once per each calendar quarter. If a charging station is installed in the middle of a quarter, data still need to be submitted from the start of operation to the end of the quarter. Calendar quarters are defined as:

- Jan. 1–March 31
- April 1–June 30
- July 1–Sept. 30
- Oct. 1 – Dec. 31

Data Collection Timeline:

Data collection starts the day a station becomes operational. All data for a calendar quarter should be submitted by the last day of the next month following the end of a quarter. For example, a station that became operational Jan. 16 would need to report quarterly data on that station from Jan. 16 to March 31, and the report should be submitted or approved no later than April 30. Higher frequency (e.g., daily, monthly) of data submission is allowed.

Reporting on Required or Recommended Fields

Each data attribute is either required per 23 CFR 680.112(a)-(c) or recommended. A recommended field is information that has been deemed pertinent but not required. If recommended fields are reported, they must be reported concurrently, within the same module, as required fields. Submission of recommended fields is encouraged to enhance evaluation and analysis.

Primary Key Constraint

Each module contains at least one primary key that uniquely identifies a record (informally a single row of data) reported in each module. The primary keys for each module are listed in Table 1.

Table 1. Primary Keys Defined for Each Module

Module	Primary Keys
1	Station ID
2	Station ID, Port ID, Session ID
3	Station ID, Port ID, Uptime Reporting Start Date
4	Station ID, Port ID, Outage ID
5	Station ID, Maintenance and Repair Cost Reporting Start Date
6	Station ID
7	Station ID, Opportunity Program Reporting Year
8	Station ID, DER Asset Type
9	Station ID

Primary keys may be used to establish relationships (i.e., be a foreign key) between separate modules. For this reason, throughout their lifetimes, <u>Station ID and Port ID should never be changed, modified, or renamed, and per 23 CFR 680.112(a), they must be the same IDs identified in the data made available to third parties specified in 23 CFR 680.116(c).</u>

Data Summarization Table

Table 2. Summary of Required Data Items per 23 CFR 680.112

Module	Data Attribute	Field Name	Data Type	Submission Frequency
All	Station ID	station_id	String	Varies
2, 3, 4	Port ID	port_id	String	Quarterly
5 and 9	Project ID*	project_id	String	Varies
Module 1: Station Location	Station Address*	station_address	String	One Time
	Station City*	station_city	String	
	Station State*	station_state	String(2)	
	Station ZIP*	station_zip	String(5)	
	Station ZIP Extended*	station_zip_extended	String(4)	
	Station Longitude*	station_longitude	Decimal(11,8)	
	Station Latitude*	station_latitude	Decimal(10,8)	
Module 2: Charging Sessions	Charger ID*	charger_id	String	Quarterly
	Session ID	session_id	String	
	Connector ID*	connector_id	String	
	Network Provider ID*	provider_id	String	
	Session Start	session_start	DateTime	
	Session End	session_end	DateTime	
	Session Error	session_error	String	
	Session Error Description*	error_other	String	
	Energy Charged	energy_kwh	Decimal(7,2)	
	Peak Power	power_kw	Decimal(7,2)	
	Payment Method	payment_method	String	
	Payment Method Description*	payment_other	String	
Module 3: Uptime	Uptime Reporting Start Date	uptime_reporting_start	DateTime	Quarterly
	Uptime Reporting End Date	uptime_reporting_end	DateTime	
	Uptime	uptime	Decimal(5,2)	
	Total Outage	total_outage	Decimal(6,2)	
	Total Excluded Outage	total_outage_excl	Decimal(6,2)	
Module 4: Outages	Outage ID	outage_id	DateTime	Quarterly
	Outage Duration	outage_duration	Decimal(8,2)	
	Maintenance and Repair Cost Reporting Start Date	maintenance_report_start	DateTime	Annual

Module	Data Attribute	Field Name	Data Type	Submission Frequency
Module 5: Maintenance Costs	Maintenance and Repair Cost Reporting End Date	maintenance_report_end	DateTime	
	Charging as a Service*	caas	Boolean	
	Total Maintenance and Repair Cost	maintenance_cost_total	Decimal(9,2)	
	Federal Maintenance and Repair Cost	maintenance_cost_federal	Decimal(9,2)	
Module 6: Station Operator Identity	Station Operator Name	operator_name	String	One Time
	Station Operator Address	operator_address	String	
	Station Operator City	operator_city	String	
	Station Operator State	operator_state	String(2)	
	Station Operator ZIP	operator_zip	String(5)	
	Station Operator ZIP Extended*	operator_zip_extended	String(4)	
Module 7: Station Operator Program	Opportunity Program Reporting Year	program_report_year	Integer(4)	Annual
	Opportunity Program Participation	opportunity_program	String	
	Opportunity Program Description*	program_descript	String	
Module 8: DER Information	DER Upgrade*	der_upgrade	Boolean	One Time
	Distributed Energy Resource On-Site	der_onsite	Boolean	
	DER Asset Type	der_type	String	
	DER Asset Type Description*	der_type_other	String	
	Power Output Capacity	der_kw	Integer	
	Energy Storage Capacity	der_kwh	Integer	
Module 9: Capital and Installation Costs	Station Upgrade*	station_upgrade	Boolean	One Time
	Real Property Acquisition Date*	real_property_acq_date	DateTime	
	Real Property Acquisition Owned*	real_property_acq_type	Boolean	
	Total Real Property Acquisition Cost	real_property_cost_total	Decimal(11,2)	
	Federal Real Property Acquisition Cost	real_property_cost_federal	Decimal(11,2)	
	Charging Equipment Acquisition Date*	equipment_acq_date	DateTime	

Module	Data Attribute	Field Name	Data Type	Submission Frequency
	Charging Equipment Acquisition Owned*	equipment_acq_type	Boolean	
	Total Charging Equipment Acquisition Cost	equipment_cost_total	Decimal(11,2)	
	Federal Charging Equipment Acquisition Cost	equipment_cost_federal	Decimal(11,2)	
	Charging Equipment Installation Date*	equipment_install_date	DateTime	
	Total Charging Equipment Installation Cost	equipment_install_cost_total	Decimal(11,2)	
	Federal Charging Equipment Installation Cost	equipment_install_cost_federal	Decimal(11,2)	
	Charging Equipment Installation Cost - Electric Material*	equipment_install_cost_elec	Decimal(11,2)	
	Charging Equipment Installation Cost - Construction Material*	equipment_install_cost_const	Decimal(11,2)	
	Charging Equipment Installation Cost – Labor*	equipment_install_cost_labor	Decimal(11,2)	
	Charging Equipment Installation Cost – Other*	equipment_install_cost_other	Decimal(11,2)	
	Distributed Energy Acquisition Owned*	der_acq_type	Boolean	
	Total Distributed Energy Acquisition Cost	der_cost_total	Decimal(11,2)	
	Federal Distributed Energy Acquisition Cost	der_cost_total	Decimal(11,2)	
	Total Distributed Energy Installation Cost	der_install_cost_total	Decimal(11,2)	
	Federal Distributed Energy Installation Cost	der_install_cost_federal	Decimal(11,2)	
	Total System Costs	system_cost_total	Decimal(11,2)	
	Federal System Costs	system_cost_federal	Decimal(11,2)	
	Total Distribution Cost	distribution_cost_total	Decimal(11,2)	
	Federal Distribution Cost	distribution_cost_federal	Decimal(11,2)	
	Total Service Costs	service_cost_total	Decimal(11,2)	
	Federal Service Costs	service_cost_federal	Decimal(11,2)	

* This data attribute's reporting is "recommended."

Data Definitions, Examples, and Types

1 Station Location

3 EVSE Ports

4 Connectors
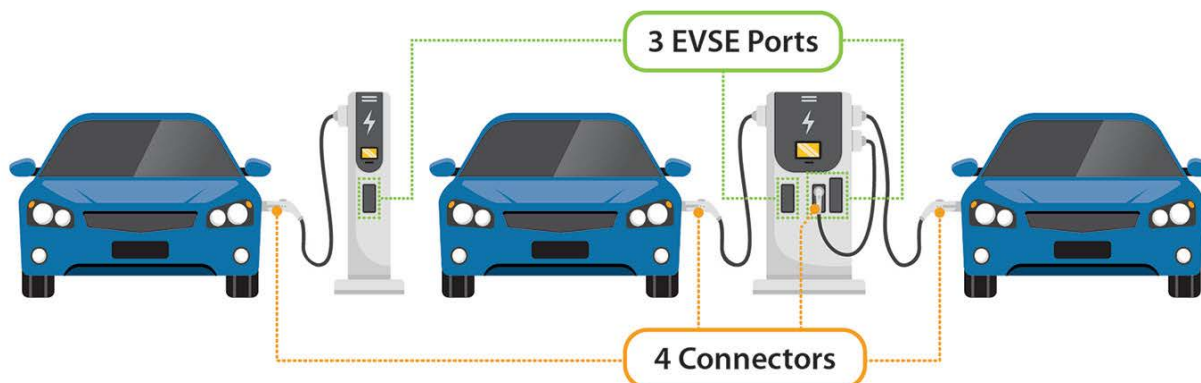
Station ID

Definition

This uniquely identifies a charging station (either ID or name). A charging station is the area in the immediate vicinity of a group of chargers and includes the chargers, supporting equipment, parking areas adjacent to the chargers, and lanes for vehicle ingress and egress. Note that a charging station could comprise only part of the property on which it is located.

Example

LOC1

Type

String

Port ID

Definition

This uniquely identifies a charging port. A charging port is the system within a charger that charges one EV. A charging port may have multiple connectors, but it can provide power to only one EV through one connector at a time. In cases where there exists more than one charging port on a charger, each charging port must be uniquely identified by a charging port ID.

This specified charging port ID must be the same value used to identify the charging port in data made available to third parties in

680.116(c)(8)(ii). The port_id attribute corresponds to evse_uid in OCPI 2.2.1.

Examples
- 3256
- EG98

Type
String

Project ID*

Definition
Federal Award Identification Number (FAIN) or other identifiers that uniquely identify the NEVI Formula Program project and/or the grant awarded under 23 U.S.C. 151(f) for projects that are for EV charging stations located along and designed to serve the users of designated AFCs.

Examples
- AB-1234-567-89
- 12Q3456789

Type
String

Station Address*

Definition
The street address specifying the location of the charging station. All components of the street address should be given, including street address number, street name, and sub-address (e.g., floor or unit number).

Examples
- 0 Prince Street, Alexandria, VA 22314
- 0 1/2 Fifth Avenue, New York, NY 10003
- 210 East 400 South, Salt Lake City, UT 84111
- Milepost 240 Parks Highway, Alaska
- Milepost 72.9 Interstate 84, Wasco County, OR
- Kilometer 0.5 Carretera 917, Urbanizacion April Gardens, Las Piedras, PR 00771
- Kilometer 2 Hectometer 7 Carretera 175, Barrio San Antonio, Caguas, Puerto Rico 00725
- N89W16758 Appleton Avenue, Menomonee Falls, WI 53051
- W63N645 Washington Avenue, Cedarburg, WI 53012

- <u>5-5415 Kuhio Highway</u>, Hanalei, HI 96714
- <u>194-03 1/2 50th Avenue</u>, New York, NY 11365
- <u>A 19 Calle 11</u>, Toa Alta, Puerto Rico

Type
String

Station City*

Definition
The name of the incorporated municipality (or other general-purpose local governmental unit) in which the charging station is located. This field should be used to identify any rural settlement in an unincorporated area, if applicable.

Examples
- 0 Prince Street, <u>Alexandria</u>, VA 22314
- 0 1/2 Fifth Avenue, <u>New York</u>, NY 10003
- 210 East 400 South, <u>Salt Lake City</u>, UT 84111
- Milepost 72.9 Interstate 84, <u>Wasco County</u>, OR
- Kilometer 0.5 Carretera 917, Urbanizacion April Gardens, <u>Las Piedras</u>, PR 00771
- Kilometer 2 Hectometer 7 Carretera 175, Barrio San Antonio, <u>Caguas</u>, Puerto Rico 00725
- N89W16758 Appleton Avenue, <u>Menomonee Falls</u>, WI 53051
- W63N645 Washington Avenue, <u>Cedarburg</u>, WI 53012
- 5-5415 Kuhio Highway, <u>Hanalei</u>, HI 96714
- 194-03 1/2 50th Avenue, <u>New York</u>, NY 11365
- A 19 Calle 11, <u>Toa Alta</u>, Puerto Rico

Type
String

Station State*

Definition
Two-character U.S. Postal Service (USPS) abbreviation indicating the state (or state equivalent) in which the charging station is located. A state (or equivalent) is a primary governmental division of the United States, including the 50 U.S. states, District of Columbia, and all U.S. territories and outlying possessions.

Examples
- IL
- DE
- PR

Type

String(2)

Station ZIP*

Definition

The five-digit code that identifies the individual post office or metropolitan area delivery station associated with the address of a charging station.

Example

<u>35242</u>-3426

Type

String(5)

Station ZIP Extended*

Definition

A four-digit extension of the five-digit station ZIP data attribute (preceded by a hyphen) that, in conjunction with station ZIP, identifies the specific range of USPS delivery addresses in which a charging station is located.

Example

35242-<u>3426</u>

Type

String(4)

Station Longitude*

Definition

Longitude of the charging station location, derived based on point placement and in decimal degrees. Note that a charging station could comprise only part of the property on which it is located. Provide the longitude specifically of the charging station rather than that of the parcel on which it is located.

Example

−84.29049105

Type

Decimal(11,8)

Unit

Decimal degrees

Station Latitude*

Definition

Latitude of the charging station location, derived based on point placement and in decimal degrees. Note that a charging station could comprise only part of the property on which it is located. Provide the latitude specifically of the charging station rather than that of the parcel on which it is located.

Example

33.77603207

Type

Decimal(10,8)

Unit

Decimal degrees

Charger ID*

Definition

This uniquely identifies a charger. A charger (or post) is a device with one or more charging ports and connectors for charging EVs.

Example

403

Type

String

Session ID

Definition

This uniquely identifies each charging session. A charging session is a period of time that is initiated when an EV is connected to a charging port (plugged in) and concludes when the EV is disconnected from the charging port (unplugged).

The session_id attribute corresponds to session_id in OCPI 2.2.1.

Examples

- 101
- 01KOL

Type

String

Connector ID*

Definition

This uniquely identifies a single connector. A connector is the device that attaches the EV to charging ports in order to transfer electricity.

The connector_id attribute corresponds to connector_id in OCPI 2.2.1.

Example

101

Type

String

Network Provider ID*

Definition

This uniquely identifies the charging network provider that enables the charging session (session ID).

See ev_network field on the Alternative Fuels Data Center website (https://afdc.energy.gov/data_download/alt_fuel_stations_format) for recommended name for network provider.

A charging network provider is the entity that operates the digital communication network that remotely manages the chargers. The provider_id attribute corresponds to the party_id field in OCPI 2.2.1.

Examples

- Tesla
- eVgo Network
- FCN

Type

String

Session Start

Definition

Timestamp (following RFC 3339 in UTC, as shown in OCPI 2.2.1 DateTime Section 16.2) identifying when the charging session (charging session ID) became active in the platform of the charging network provider. The session_start data attribute corresponds to start_date_time in Session Object in OCPI 2.2.1.

A charging session is considered active when all preconditions for a session being accepted and active are met: There has been communication between the EV and charger (e.g., cable was correctly

plugged in), and the EV or driver is authorized by the network provider to charge. At this time, the EV is being charged (or can be charged) and energy is (or is not) being transferred to the EV.

Example

2023-07-03T12:51:48Z

Type

DateTime

Unit

UTC

Session End

Definition

Timestamp (following RFC 3339 in UTC, as shown in OCPI 2.2.2 DateTime Section 16.2) identifying when the charging session (charging session ID) was completed. The session_end data attribute corresponds to end_date_time in Session Object in OCPI 2.2.1. Note that charging might have finished before the session ends (e.g., EV is full but customer must continue to pay for parking spot until session is completed).

Example

2023-07-03T12:51:48Z

Type

DateTime

Unit

UTC

Session Error

Definition

Any error codes associated with an unsuccessful charging session. If more than one error code is associated with an unsuccessful charging session, a comma-separated list of all relevant error codes must be given. Specify "None" if there are no errors associated with the charging session.

Table 3. Recommended Values for Session Error

Value	Error Code Name	Description
none	None	No errors associated with the charging session.
CX001	ConnectorLockFailure	Failure to lock or unlock connector on the vehicle side.
CX002	GroundFailure	Ground fault circuit interrupter has been activated.
CX003	HighTemperature	High temperature inside the EVSE is derating power delivery.
CX004	OverCurrentFailure	Over current protection device has tripped.
CX005	OverVoltage	Input voltage to the vehicle has risen above an acceptable level.
CX006	UnderVoltage	Input voltage to the vehicle has dropped below an acceptable level.
CX007	WeakSignal	Wireless communication device reported a weak signal.
CX008	EmergencyStop	Emergency stop is pressed by the user (required if equipped).
CX009	AuthorizationTimeout	The user plugs in but fails to authorize a charging session prior to the connection timeout between the vehicle and EVSE.
CX010	InvalidVehicleMode	The vehicle is in an invalid mode for charging.
CX011	CableCheckFailure	Failure during the cable check phase. Includes isolation failure
CX012	PreChargeFailure	The EVSE did not reach the correct pre-charge voltage.
CX013	NoInternet	The EVSE has no internet connectivity.
CX014	PilotFault	The control pilot voltage is out of range.
CX015	PowerLoss	The EVSE is unable to supply any power due to mains failure.
CX016	EVContactorFault	Contactors fail to open or close on the vehicle side. May also include welding related errors.
CX017	EVSEContactorFault	Contactors fail to open or close on EVSE's side. May also include welding related errors.
CX018	CableOverTempDerate	Temperature of charging cable or connector assembly is too high, resulting in reduced power operation.
CX019	CableOverTempStop	Temperature of charging cable or connector assembly is too high, resulting in a stopped charging session.
CX020	PartialInsertion	Cable latch is raised due to incomplete insertion into the vehicle charging port.
CX021	CapacitanceFault	An Isolation Monitoring Device tripped due to high capacitance during active charging.
CX022	ResistanceFault	An Isolation Monitoring Device tripped due to low resistance to the chassis during active charging.
CX023	ProximityFault	The proximity voltage is out of range.
CX024	ConnectorVoltageHigh	The output voltage of EVSE is high before charging starts or after charging ends.
CX025	BrokenLatch	The latch on the connector is broken.
CX026	CutCable	The output cable has been severed from the EVSE.
other	Other	Any other errors not specified above. Additional description must be provided in session error description.

More information on recommended error codes can be found in *Recommendations for Minimum Required Error Codes for Electric Vehicle Charging Infrastructure* and *Implementation Guide for Minimum Required Error Codes in Electric Vehicle Charging Infrastructure* by the [ChargeX Consortium](#).

Examples

- {CX020}
- {CX009, CX013}
- {CX025, other}
- {other}
- {none}

Type

String

*Session Error Description**

Definition

The description for any other error codes associated with an unsuccessful charging session that are not categorized in the recommended error codes in session_error (i.e., "other" was selected for session_error). If multiple errors need to be defined, they should be given by a comma-separated list.

Examples

- Error description 1
- Error description 1, error description 2

Type

String

Energy Charged

Definition

Amount of energy (in kilowatt-hours) dispensed by the port (port ID) during the charging session (session ID). Energy charged corresponds to the attribute ENERGY_IMPORT defined in the CdrDimensionType object in OCPI 2.2.1.

Specify value as "none" for a session that was not successful—i.e., no energy was dispensed, and a non-empty value of session error is associated with this charging session.

Examples

- 52.31
- none

Type

Decimal(7,2)

Unit

kWh

Peak Power

Definition

Maximum power (in kilowatts) dispensed by the port (port ID) during charging session (session ID). Peak power corresponds to the MAX_POWER attribute defined in the CdrDimensionType object in OCPI 2.2.1.

Specify value as "none" for a session that was not successful—i.e., no energy was dispensed, and a non-empty value of session error is associated with this charging session.

Examples

- 120.43
- None

Type

Decimal(7,2)

Unit

kW

Payment Method

Definition

Method(s) of payment used to complete the charging session (session ID). If more than one payment method is associated with a charging session, a comma-separated list of all relevant payment methods must be given.

Table 4. Recommended Values for Payment Method

Value	Description
None	Successful or unsuccessful charging session with no payment received
membership	Payment by membership account and/or membership card
credit_card_terminal	Payment via credit card or debit card terminal
phone_online	Payment through mobile app, website, automated phone number, or messaging system
plug_charge	Payment via ISO 15118 Plug and Charge
roaming	Payment via roaming partners

Value	Description
other	Any other payment method not specified above. Additional description should be provided in payment method description.

Examples

- membership
- credit_card_terminal, phone_online
- other
- none

Type

String

Payment Method Description*

Definition

The description for any method(s) of payment used to complete the charging session that are not categorized in the recommended payment methods in payment_method (i.e., "other" was selected for payment_method). If multiple payments need to be defined, they should be given by a comma-separated list.

Examples

- Cash
- Cash, transit card

Type

String

Uptime Reporting Start Date

Definition

Timestamp (following RFC 3339 in UTC, as shown in OCPI 2.2.2 DateTime Section 16.2) identifying the start date of the reporting period for port uptime, total outage, and total excluded outage.

Example

2023-07-03T12:51:48Z

Type

DateTime

Unit

UTC

Uptime Reporting End Date

Definition

Timestamp (following RFC 3339 in UTC, as shown in OCPI 2.2.2 DateTime Section 16.2) identifying the end date of the reporting period for port uptime, total outage, and total excluded outage.

Example

2023-07-03T12:51:48Z

Type

DateTime

Unit

UTC

Uptime

Definition

The uptime of a port (port ID) is the time over the previous 12 months when a charger's hardware and software are both online and available for use or in use, and the charging port successfully dispenses electricity in accordance with requirements for minimum power level.

23 CFR 680.112 and 23 CFR 680.116(b) requires that port uptime be calculated on a monthly basis for the previous twelve months, in accordance with the equation in 23 CFR 680.116(b)(3) for each month of the reporting period:

$$\mu = ((525{,}600 - (T\_outage - T\_excluded)) / 525{,}600) \times 100$$

Where:

μ = port uptime percentage for a given port ID

T_outage = total minutes of outage for the port ID in previous year

T_excluded = total minutes of outage for the port ID in previous year for reasons outside the charging station operator's control.

Reasons for outage outside the charging station operator's control, provided that the charging station operator can demonstrate that the charging port would otherwise be operational, may include but are not limited to electric utility service interruptions, failure to charge or meet the EV charging customer's expectation for power delivery due to the fault of the vehicle, scheduled maintenance, vandalism, or natural disasters. Also excluded are hours outside of the identified hours of operation of the charging station.

Port uptime must be calculated as a rolling annual percentage according to the above formula that is updated each month.

Examples

- 98.23
- 0.00
- 100.00

Type

Decimal(5,2)

Total Outage

Definition

The total time (in minutes) over the previous 12 months during which the charging port (port ID) did not successfully dispense electricity as expected. This corresponds to the T_outage value in port uptime formula in 23 CFR 680.116(b).

Examples

- 50.25
- 0.00
- 8760.00

Type

Decimal(6,2)

Unit

Minutes

Total Excluded Outage

Definition

The total time (in minutes) over the previous 12 months during which the charging port (port ID) did not successfully dispense electricity as expected for reasons outside the charging station operator's control, provided that the charging station operator can demonstrate that the charging port would otherwise be operational: electric utility service interruptions, failure to charge or meet the EV charging customer's expectation for power delivery due to the fault of the vehicle, scheduled maintenance, vandalism, or natural disasters. Also excluded are hours outside of the identified hours of operation of the charging station. This corresponds to the T_excluded value in port uptime formula in 23 CFR 680.116(b).

Charging station operators should be able to demonstrate that the charging port would otherwise be operational.

Examples

- 50.25
- 0.00
- 8760.00

Type

Decimal(6,2)

Unit

Minutes

Outage ID

Definition

Timestamp uniquely identifying a single instance of an outage for a given charging port (port ID). An outage is any period of time during which a charging port cannot successfully dispense electricity as expected.

Outages must be identified regardless of whether their occurrence is for reasons outside of the control of the charging station operator (see outage and excluded outage data attributes for details). The outage_id should follow RFC 3339 in UTC, as shown in OCPI 2.2.1 DateTime type.

Example

2023-07-03T12:51:48Z

Type

DateTime

Unit

UTC

Outage Duration

Definition

Length of time (in minutes) during which the charging port (port ID) could not successfully dispense electricity as expected. Outage duration must be reported for each outage instance (outage ID) and measure the duration of the entire outage, starting from initial disruption in electricity being dispensed as expected to when charging port is able to dispense electricity again successfully.

Example

120.55

Type

Decimal(8,2)

Unit

Minute

Maintenance and Repair Cost Reporting Start Date

Definition

Timestamp (following RFC 3339 in UTC, as shown in OCPI 2.2.2 DateTime Section 16.2) identifying the start date associated with reported maintenance and repair costs. Maintenance and repair cost data are reported on an annual basis, on or before March 1 for the previous calendar year.

Example

2023-07-03T12:51:48Z

Type

DateTime

Unit

UTC

Maintenance and Repair Cost Reporting End Date

Definition

Timestamp (following RFC 3339 in UTC, as shown in OCPI 2.2.2 DateTime Section 16.2) identifying the end date associated with reported maintenance and repair costs. Maintenance and repair cost data are reported on an annual basis, on or before March 1 for the previous calendar year.

Example

2023-07-03T12:51:48Z

Type

DateTime

Unit

UTC

Charging as a Service*

Definition

Indicator for whether total maintenance and repair cost at the charging station (charging station ID) is reported as a total cost from a "charging as a service" agreement that does *not* provide itemized maintenance and repair cost, and the total cost may include equipment acquisition, installation, and other services.

Example

TRUE

Type

Boolean

Total Maintenance and Repair Cost

Definition

Total amount paid for maintenance and repair at the charging station (charging station ID) during the calendar year specified in "maintenance and repair cost reporting year."

Example

2500.35

Type

Decimal(9,2)

Unit

USD

Federal Maintenance and Repair Cost

Definition

Total amount paid for maintenance and repair at the charging station (charging station ID) during the calendar year specified in "maintenance and repair cost reporting year" with federal funding.

Example

1800.00

Type

Decimal(9,2)

Unit

USD

Station Operator Name

Definition

Name of the entity that operates and maintains the chargers and supporting equipment and facilities of the charging station, known as the charging station operator. In some cases, the charging station operator and the charging network provider are the same entity.

Example

Electrify America

Type

String

Station Operator Address

Definition

The street address specifying the headquarters of the charging station operator.

Example

See station address (above)

Type

String

Station Operator City

Definition

The name of the incorporated municipality (or other general-purpose local governmental unit) in which the headquarters of the charging station operator is located. This field should be used to identify any rural settlement in an unincorporated area, if applicable.

Example

See station city (above)

Type

String

Station Operator State

Definition

Two-character USPS abbreviation indicating the state (or state equivalent) in which the headquarters of the charging station operator is located. A state (or equivalent) is a primary governmental division of the United

States, including the 50 U.S. states, District of Columbia, and all U.S. territories and outlying possessions.

Example

See station state (above)

Type

String(2)

Station Operator ZIP

Definition

The five-digit code that identifies the individual post office or metropolitan area delivery station associated with the address of the headquarters of the charging station operator.

Example

<u>35242</u>-3426

Type

String(5)

Station Operator ZIP Extended*

Definition

A four-digit extension of the five-digit charging station ZIP code (preceded by a hyphen) that, in conjunction with the charging station operator ZIP data attribute, identifies the specific range of USPS delivery addresses in which the headquarters of the charging station operator is located.

Example

35242-<u>3426</u>

Type

String(4)

Opportunity Program Reporting Year

Definition

Calendar year associated with the charging station operator's participation in community opportunity programs. Participation data are reported on an annual basis, on or before March 1.

Example

2024

Type

Integer(4)

Opportunity Program Participation

Definition

The type of state or local business opportunity certification program(s) the operator of the charging station participated in during the calendar year specified in opportunity program reporting year. If the charging station participates in more than one opportunity program, a comma-separated list of all types must be given.

Table 5. Recommended Values for Opportunity Program Participation

Value	Description
None	The business does not identify as participating in any state or local business opportunity certification program.
minority_owned	The business identifies as participating in a state or local business opportunity certification program for minority-owned businesses.
veteran_owned	The business identifies as participating in a state or local business opportunity certification program for veteran-owned businesses.
woman_owned	The business identifies as participating in a state or local business opportunity certification program for woman-owned businesses.
economically_disadvantaged_owned	The business identifies as participating in a state or local business opportunity certification program for businesses owned by economically disadvantaged individuals.
other	The business identifies as participating in another state or local business opportunity certification program. Additional description should be provided in the opportunity program description.

Examples

- veteran_owned, woman_owned
- woman_owned
- veteran_owned, other
- other
- none

Type

String

*Opportunity Program Description**

Definition

The description of opportunity_program if "other" is chosen from the recommended opportunity programs. The structure should be: "the_description_of_the_opportunity_program-the definition." If multiple opportunity programs need to be named, they should be given by a comma-separated list.

Example

lgbtq_owned-business has 51% LGBTQ ownership

Type

String

DER Upgrade*

Definition

Indicator for whether the charging station (station ID) is an existing station (i.e., charging stations that were installed prior to this funded project and/or grant) that uses federal funds for updates, upgrades, or replacements of the DER on-site. "TRUE" if the charging station is an existing station, "FALSE" if the charging station is a new station.

Example

TRUE

Type

Boolean

Distributed Energy Resource On-Site

Definition

Indicator for whether a DER is present at the charging station. A DER is defined as any small, modular, energy generation and storage technologies that provide electric capacity or energy where it is needed.

Example

TRUE

Type

Boolean

DER Asset Type

Definition

The type of asset(s) that comprise the DER available on-site. This should only be for one asset type. If more than one asset type comprises the DER on-site, an additional record/row should be submitted.

Table 6. Recommended Values for DER Asset Type

Value
solar
wind
stationary_battery
hydrogen_fuel_cell
other
none

Examples

- {solar}
- {none}
- {wind, other}

Type

String

DER Asset Type Description*

Definition

The name and description for any other type(s) of assets that are not categorized in the recommended DER asset types. The structure should be: "the_name_of_the_DER-the definition."

Example

combined_heat_and_power_units-utilize waste heat to provide cooling

Type

String

Power Output Capacity

Definition

The power generation capacity (in kilowatts) of the DER as power generation, or the maximum discharge power capacity (in kilowatts) of the DER as energy storage available on-site.

If der_onsite is "FALSE," the value should be zero.

Examples

- 100
- 0

Type

Integer

Unit

kW

Energy Storage Capacity

Definition

The capacity (in kilowatt-hours) of the DER as energy storage available on-site.
If der_onsite is "FALSE," the value should be zero.

Examples

- 45
- 0

Type

Integer

Unit

kWh

Station Upgrade*

Definition

Indicator whether the charging station (station ID) is an existing station (i.e., charging stations that were installed prior to this funded project and/or grant) that uses federal funds for updates, upgrades, or replacements. 'TRUE' if the charging station is an existing station, 'FALSE' if the charging station is a new station.

Example

TRUE

Type

Boolean

Real Property Acquisition Date*

Definition

Timestamp (following RFC 3339 in UTC, as shown in OCPI 2.2.2 DateTime Section 16.2) identifying the date associated with acquisition of the real property on which the charging station (station ID) is located.

Example

2023-07-03T12:51:48Z

Type

DateTime

Unit

UTC

Real Property Acquisition Owned*

Definition

Indicator for whether the real property on which the charging station (station ID) is located is purchased or leased. "TRUE" if the real property

is acquired by a purchase agreement, "FALSE" if the real property is acquired by a lease agreement.

Example

TRUE

Type

Boolean

Total Real Property Acquisition Cost

Definition

Total amount paid for the parcel on which the charging station (station ID) is located. A parcel is bounded by a property line or a designated portion of a public thoroughfare. Note that a charging station could comprise only part of the property on which it is located. For real property that is leased, total real property acquisition cost should be the annualized leasing cost.

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

Federal Real Property Acquisition Cost

Definition

Total amount paid using federal funding for the parcel on which the charging station (station ID) is located. A parcel is bounded by a property line or a designated portion of a public thoroughfare. Note that a charging station could comprise only part of the property on which it is located. For real property that is leased, federal real property acquisition cost should be the annualized leasing cost using federal funding.

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

Charging Equipment Acquisition Date*

Definition

Timestamp (following RFC 3339 in UTC, as shown in OCPI 2.2.2 DateTime Section 16.2) identifying the date associated with acquisition of the charging equipment associated with a given charging station (station ID).

Example

2023-07-03T12:51:48Z

Type

DateTime

Unit

UTC

Charging Equipment Acquisition Owned*

Definition

Indicator for whether the charging equipment associated with a given charging station (station ID) is purchased or leased. "TRUE" if the charging equipment is purchased, "FALSE" if the charging equipment is leased or acquired as part of "charging as a service" agreement.

Example

TRUE

Type

Boolean

Total Charging Equipment Acquisition Cost

Definition

Total amount paid for the charging equipment associated with a given charging station (station ID). For charging equipment that is leased, the total charging equipment acquisition cost should be the annualized leasing cost. For charging equipment that is part of a "charging as a service" agreement without itemized charging equipment acquisition cost, use total maintenance and repair cost to report service cost that includes equipment, maintenance, and repair.

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

Federal Charging Equipment Acquisition Cost

Definition

Total amount paid using federal funding for the charging equipment associated with a given charging station (station ID). For charging equipment that is leased, federal charging equipment acquisition cost should be the annualized leasing cost using federal funding. For charging equipment that is part of a "charging as a service" agreement without itemized charging equipment acquisition cost, use total maintenance and repair cost to report service cost that includes equipment, maintenance, and repair.

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

Charging Equipment Installation Date*

Definition

Timestamp (following RFC 3339 in UTC, as shown in OCPI 2.2.2 DateTime Section 16.2) identifying the installation data of the charging equipment associated with a given charging station (station ID).

Example

2023-07-03T12:51:48Z

Type

DateTime

Unit
> UTC

Total Charging Equipment Installation Cost

Definition
> Total amount paid for the installation of charging equipment at a given charging station (station ID).

Examples
- 1010.00
- 0.00

Type
> Decimal(11,2)

Unit
> USD

Federal Charging Equipment Installation Cost

Definition
> Total amount paid using federal funding for the installation of charging equipment at a given charging station (station ID).

Examples
- 1010.00
- 0.00

Type
> Decimal(11,2)

Unit
> USD

Charging Equipment Installation Cost – Electric Material*

Definition
> Total amount paid for electrical materials (e.g., conduit/wiring, switchgears, insulation) for the installation of the charging equipment at a given charging station (station ID). This cost should be part of the total charging equipment installation cost.

Examples
- 1010.00

- 0.00

Type

Decimal(11,2)

Unit

USD

Charging Equipment Installation Cost – Construction Material*

Definition

Total amount paid for construction materials (e.g., concrete, asphalt, wheel stops) for the installation of the charging equipment at a given charging station (station ID). This cost should be part of the total charging equipment installation cost.

Examples

- 1010.00
- 0.00

Type

Decimal (11, 2)

Unit

USD

Charging Equipment Installation Cost – Labor*

Definition

Total amount paid for labor for the installation of the charging equipment at a given charging station (station ID). This cost should be part of the total charging equipment installation cost.

Examples

- 1010.00
- 0.00

Type

Decimal (11, 2)

Unit

USD

Charging Equipment Installation Cost – Other*

Definition

Total amount paid for items not associated with electric material, construction material, or labor for the installation of the charging equipment at a given charging station (station ID). This cost should be part of the total charging equipment installation cost.

Examples

- 1010.00
- 0.00

Type

Decimal (11, 2)

Unit

USD

Distributed Energy Acquisition Owned*

Definition

Indicator for whether the DER components, including energy generation and storage equipment, are purchased or leased. "TRUE" if the DER components are purchased, "FALSE" if the DER components are leased.

Example

TRUE

Type

Boolean

Total Distributed Energy Acquisition Cost

Definition

Total amount paid for the acquisition of DER components, including energy generation and storage equipment. This value is distinct from the purchase price of the charging equipment (charging equipment acquisition cost). For DER components that are leased, total distributed energy acquisition cost should be the annualized leasing cost.

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

Federal Distributed Energy Acquisition Cost

Definition

Total amount paid using federal funding for the acquisition of DER components, including energy generation and storage equipment. This value is distinct from the purchase price of the charging equipment (charging equipment acquisition cost). For DER components that are leased, federal distributed energy acquisition cost should be the annualized leasing cost using federal funding.

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

Total Distributed Energy Installation Cost

Definition

Total amount paid for the installation of the DER on-site.

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

Federal Distributed Energy Installation Cost

Definition

Total amount paid using federal funding for the installation of the DER on-site.

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

Total System Cost

Definition

Total system upgrade costs paid to the utility in order to enable grid connection (e.g., upgrades to substation, transmission lines, main feeder).

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

Federal System Cost

Definition

Total system upgrade costs paid using federal funding to the utility in order to enable grid connection (e.g., upgrades to substation, transmission lines, main feeder).

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

Total Distribution Cost

Definition

Total distribution work costs paid to the utility in order to enable grid connection (e.g., extensions to overhead or underground lines, upgrades from single-phase to three-phase lines).

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

Federal Distribution Cost

Definition

Total distribution work costs paid using federal funding to the utility in order to enable grid connection (e.g., extensions to overhead or underground lines, upgrades from single-phase to three-phase lines).

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

Total Service Cost

Definition

Total service costs paid to the utility in order to enable grid connection (e.g., cost of poles, transformers, meters, and on-service connection equipment).

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

Federal Service Costs

Definition

Total service costs paid using federal funding to the utility in order to enable grid connection (e.g., cost of poles, transformers, meters, and on-service connection equipment).

Examples

- 1010.00
- 0.00

Type

Decimal(11,2)

Unit

USD

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