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Allegato X – Controllore di infrastruttura di ricarica per veicoli elettrici

Annex X - Electric Vehicle Charging Infrastructure Controller

ESTRATTO IN INGLESE DELLA NORMA CEI 0-21

Sommario

Il presente documento è la traduzione in inglese dell'Allegato X della Norma CEI 0-21;V1 2022-11.
Si evidenzia che il CEI non ha pubblicato una versione in inglese della Norma CEI 0-21. Questa traduzione del solo Allegato X è stata predisposta dal CT 316 per essere utilizzata come documento di lavoro nell'ambito di gruppi di lavoro CENELEC o IEC.

Abstract

This document is an English translation of Annex X of CEI 0-21; V1 2022-11.
It should be noted that the CEI has not published an English version of CEI 0-21. This translation of Annex X only has been prepared by CT 316 for use as a working document within CENELEC or IEC working groups.

PREMESSA

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FOREWORD

This document is an English translation of Annex X of CEI 0-21; V1 2022-11.

It should be noted that the CEI has not published an English version of CEI 0-21. This translation of Annex X only has been prepared by CT 316 for use as a working document within CENELEC or IEC working groups.

NOTE 1: Throughout the document, CIR is the Italian acronym for "Controllore di infrastruttura di ricarica" (Charging Infrastructure Controller).

NOTE 2 : Throughout the document, CEI stands for Italian Electrotechnical Committee.

Annex X

Electric Vehicle Charging Infrastructure Controller

X.1 Object and scope

The object of this Annex is the "CHARGING INFRASTRUCTURE CONTROLLER" (hereafter CIR), i.e., the apparatus whose tasks are:

- data collection relating to the measurement of the power drawn from the charging infrastructure [1)], the power exchanged with the grid at the point of delivery and, optionally, the power drawn and injected by any generators and/or storage in the plant;
- data exchange with the qualified external party (hereafter referred to as RO "Remote Operator") for the provision/request of ancillary services. RO is the entity enabled to communicate with the User who has installed CIR in its plant (e.g., Aggregator, Distributor, etc.);
- the dynamic and parameterizable regulation of the power exchanged with the grid, taken from the EV Charging Station in mode 3 and mode 4 (defined as per CEI EN 61851 series);
- the provision of grid services for electric system security (under-frequency response) based on the availability of local grid frequency measurement.

Figure X1 shows the communication channels of CIR and charging infrastructure as examples. This Annex defines the communication modes between CIR, RO and 2G [2)] second-generation smart meter(s).

The definition of the interface between CIR and Charging Facility Controller "Charging Station Controller" (CSC in Figure X1) is not included in this Annex.

CIR allows to:

- optimize the power allocated for electric vehicle charging, depending on the absorption of other user loads in the user facility, as well as any on-site generation;
- make modulation resources available for RO to offer/require ancillary services;
- contribute to the security of the power system by providing grid services in under-frequency conditions.

The functional requirements described below take into account:

- CEI 0-21:2019 requirements for active and passive users. In particular, V1G operation is considered the same as a passive user and therefore does not require the installation of interface protection (SPI);
- technological restrictions of the standards currently in use (charging infrastructure and motor vehicles) with regard to the modulation of charging power and the suspension of charging itself.

1) Charging Infrastructure (also "Charging Station Infrastructure" - CSI) is understood as a set of one or more EV charging stations, including bidirectional ones, connected to the grid.

2) 2G Smart Meter (as referred to in CEI TS 13-82) is a second-generation metrology device capable of sampling electrical measurements and transmitting the measurements to the distributor (via Chain 1) and to the customer or, if designated by the customer, to a third party (via Chain 2). It shall comply with the minimum requirements stated in ARERA Resolution No. 87/2016/R/eel.

X.2 Scope

This Annex applies only to charging infrastructures in V1G mode (one-way type operating in mode 3 and mode 4), which participate in flexibility service markets within the framework of ARERA measures, installed in passive or active users connected to LV networks with third-party connection obligation.

This Annex does not apply to charging infrastructure operating in V2G mode, through which the electric vehicle can feed active power into the grid. As a result, the passive user installing CIR does not have to install an SPI in its installation.

X.3 Functional requirements

CIR is an apparatus whose tasks are similar to the ones of a User Device(1). Specifically, CIR must:

- perform the function of collecting data on the power exchanged at the delivery point, the power of the charging infrastructure and the power produced by any generator installed in the same user facility;
- enable the exchange of information with the RO;
- control the operation of the charging infrastructure to adjust the charging power according to the absorption of other user equipment in the user facility (including any local generation) and according to external controls from the RO;
- ensure the provision of network services for the security of the electric system (under-frequency response).

The CIR is not in charge with:

- running storage systems other than the electric vehicle;
- running generation systems.

The choice between implementing CIR as an external object, or integrated into the charging infrastructure, or into other equipment such as the Automated Coordination System (CEM)(2) is a decision that lies with CIR manufacturer.

Specifically, CIR must be able, via the communication interfaces described below, to acquire, receive, process, and/or send all the information necessary to perform the functions described above, namely:

- acquisition of contractual information such as available power and tariff bands, during configuration;
- acquisition of instantaneous power of the charging infrastructure;
- acquisition of measurements of the net power exchanged at the point of delivery from 2G smart meter (M1) of the "Instantaneous active power drawn with 1-second sampling" and alerts of exceeding the available power and possible intervention of the limiter as per Use Case A.3 - CEI TS 13-82. If 2G meter is not available, power measurements can be acquired from a dedicated metering system installed near M2 meter;
- acquisition of measurements from the intelligent 2G production meter (M2), if any. In particular, acquisition of the "Instantaneous active power generated with 1-second sampling" data. If 2G meter is not available, power measurements can be acquired from a dedicated metering system installed in the vicinity of M2 meter;
- sending measurements and statuses to RO, receiving commands from RO using the communication protocol given in X.7.2.2;

- settings of any operating parameters by the plant operator during installation or subsequent requirements.

To comply with such a procedure, CIR shall read the data sent by 2G smart meter through, for example, Chain 2; in this case an appropriate user profile shall be activated on 2G smart meter according to the required services as defined by CEI TS 13-82. The use of Chain 2 is one of the possible solutions but also the best taking into account the applications used and the current regulatory framework. In any case, all adopted solutions must ensure the same functional measurement requirements.

Later in the document, the reference to Chain 2 is used for a more intelligible speech; however, it should be kept in mind that an equivalent use to Chain 2 is still possible.

NOTE 1 User Device is an apparatus responsible for receiving information from the 2G smart meter by means of Chain 2 and conforming to the specified use.

NOTE 2 The Automated Coordination System (also CEM "Customer Energy Manager") is an apparatus or set of apparatuses capable of communicating with the 2G smart meter and/or a User Device and autonomously making schedules of the operation of loads and possibly generation systems.

X.4 General scheme of CIR

CIR interacts with one or more CSI charging infrastructures that can operate in turn one or more EVSE(1) charging stations. There is only one CIR for each interconnection point with the POD (Point of Delivery) network.

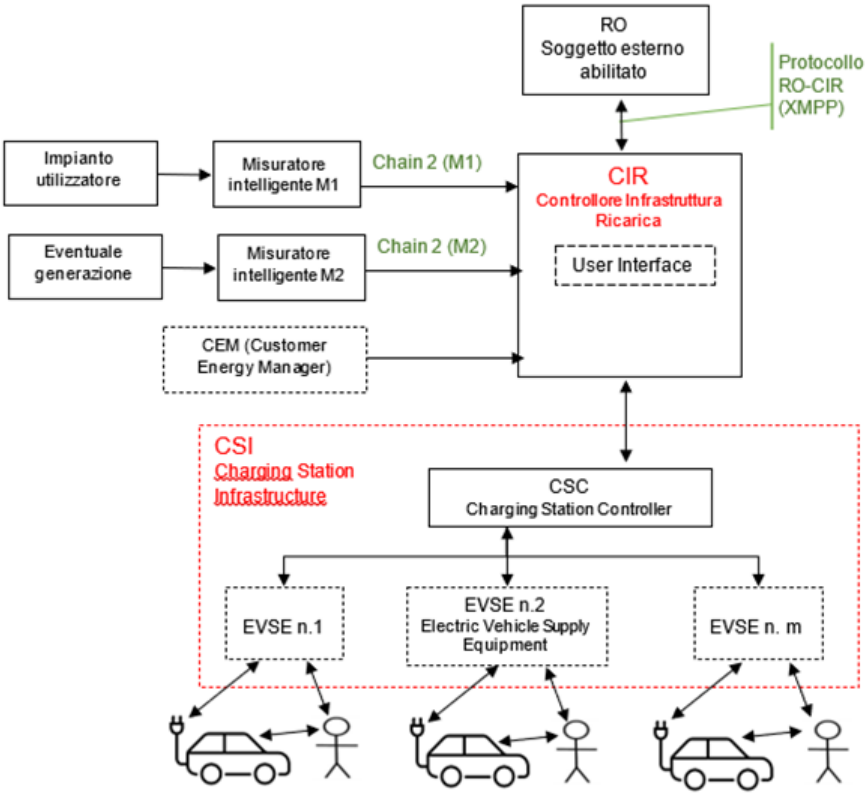

Figure X1– Reference architecture for CIR communication interfaces

CIR can be a stand-alone piece of equipment or be integrated into the Charging Infrastructure (CSI), or into another equipment such as the energy management system (CEM), or a Central Plant Controller, if any. In addition, the functions of the CIR can also be implemented in other ways, as long as they meet the functional requirements outlined in this document.

The blocks are as follows:

- meter at the point of delivery (M1): for LV users, encrypted one-way communication from 2G smart meter to CIR (which acts as a User Device here), via "Chain 2." The use cases, data model and protocol profiles, to be taken into account are those established in the relevant CEI Technical Standards (see X.7.2.1). Communication from any other 2G smart meters in the plant (e.g., M2) is also done through Chain 2;

- charging infrastructure (represented by a single charging system; in the case of multiple charging systems, the one acting as master). The manufacturer of CIRs that are not integrated into charging stations or other equipment shall provide information regarding the correct connection and signals exchanged with the charging station to perform the intended functions, or alternatively shall provide the references (trademark and model) of the charging stations with which it is compatible;

- communication with RO: communication must necessarily be through a dedicated data channel as specified in X.7;

- local interface: the manufacturer is in charge with the functions for configuration purposes and shall not interfere with the functions specified in this Annex.

NOTE 1 EVSE (Electrical Vehicle Supply Equipment) refers to the fixed part of the charging station connected to the power grid.

X.5 CIR mode of operation

CIR is set up to fulfill data exchange functionalities and control, regulation and command functionalities, in autonomous mode and automatic mode (alternatives to each other).

In the stand-alone control mode, CIR modulates the power of the charging infrastructure based only on the drawn and fed power data collected by 2G smart meter at the point of delivery and based on parameters set in advance by the plant manager or designer via local or remote interface (e.g., the "Power Management" functionality described later). The purpose of the functions is to avoid exceeding the available power with the consequent intervention of M1 meter power limiter. To avoid the intervention of the vehicle's accumulator protection system, it must be possible to define the timing for sending consecutive commands to the vehicle according to a time interval (Tatt) that can be parameterized between 1 and 60 seconds with a default value of 30 seconds.

In the automatic control mode, the power of the charging infrastructure in V1G is modulated based on commands received from RO. The automatic mode has priority over autonomous control, complying with the constraint of the available power detected by 2G smart meter; in case of communication failure, CIR returns to autonomous operation mode.

The grid service in under-frequency conditions is more important than the other modes.

The definition of the architectures adopted to implement the autonomous control mode is not covered by the scope of this Annex; the choice is left to the manufacturer’s and/or the designer’s.

X.5.1 CIR regulation function (Power Management - PM)

CIR must be able to indicate to the CSC the maximum power value of the charging infrastructure to avoid the intervention of the limiter in 2G smart meter at the delivery point (M1), even in the absence of other energy management systems. This function, which is stand-alone, is done by monitoring energy exchanges at the delivery point so that the power drawn from the grid remains below the intervention curve of the limiter present in the M1 meter. Obviously, the charging stations must be able to change dynamically i.e., when the session is started, the maximum current or power value of the charging infrastructure (as per CEI EN 61851 series).

Therefore, CIR must calculate in real time the power margin available for the charging infrastructure, which is calculated on the base of the power available and the power exchanged at the delivery point. To implement this function, it is necessary for CIR to know:

- instantaneous active power drawn and injected. This information comes from 2G smart meter (M1) through Chain 2;
- instantaneous active power of the charging infrastructure: detected by the metering system with which the charging stations are equipped.

The charging control logic involves modulating the power of the charging infrastructure so that the total absorption detected by 2G smart meter (M1) is kept below the intervention threshold of the limiter placed in the 2G smart meter itself. In the case of a traditional 3 kW household contract, the "threshold power" level is equal to the contracted power +10% (3.3 kW, corresponding to "Available Power"); below this level, the user is allowed to draw indefinitely. Furthermore, there is a system in 2G smart meter that, when crossing specific power thresholds (S1, S2, S3...) chosen during configuration of 2G smart meter, sends the instantaneous active power drawn or fed in (sampled by the 2G smart meter every second) to the user devices as shown in Figure X2 (as better defined in CEI TS 13-82, Part 7.2).

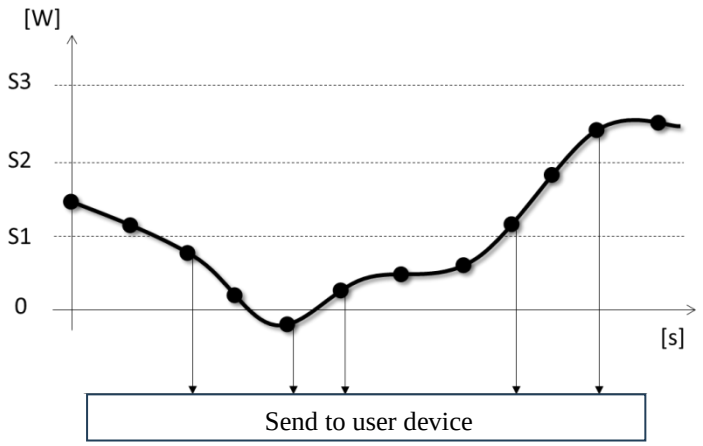

Figure X2– Logic of sending the instantaneous active power sample recorded by 2G smart meter every second by chain 2 system upon crossing predefined thresholds

As an example, the following Figure X3 and Figure X4 show the interaction between 2G type M1 smart meter and the CIR device through Chain 2 channel during the available power exceedance event. The example takes into consideration a household user who has a supply with a contracted power of 4.5 kW, corresponding to an available power of 4.95 kW. In the starting condition, charging of the electric vehicle is in progress, which is committing a power of 4 kW while the other currently active household loads are drawing 600 W, with a total drawn power at the delivery point of 4.6 kW. In this condition 2G smart meter is not in alarm. Next, the user activates an additional 1 kW load, bringing the total drawn power at the delivery point to 5.6 kW. From this moment the 2G smart meter is in alarm and notifies this condition on the Chain 2 channel by transmitting a message containing the following information (values given as an example):

– instantaneous active power drawn: 5.6 kW
– available power: 4.95 kW
– remaining time to limiter intervention: 180 minutes.

Based on this information, the CIR device can decide whether to communicate to the charging infrastructure the value of power to be drawn to bring it below the available power threshold

or to maintain the current charging power by monitoring, on the one hand, the timeout of intervention of the limiter that it will have activated internally and, on the other hand, any further notifications from 2G smart meter.

In fact, should the user turn off the 1kW load after 30 minutes, the total drawn power would return below the available power and 2G smart meter would exit the alarm condition. The latter would notify this condition on Chain 2 channel by transmitting a message containing the new value of instantaneous active power drawn.

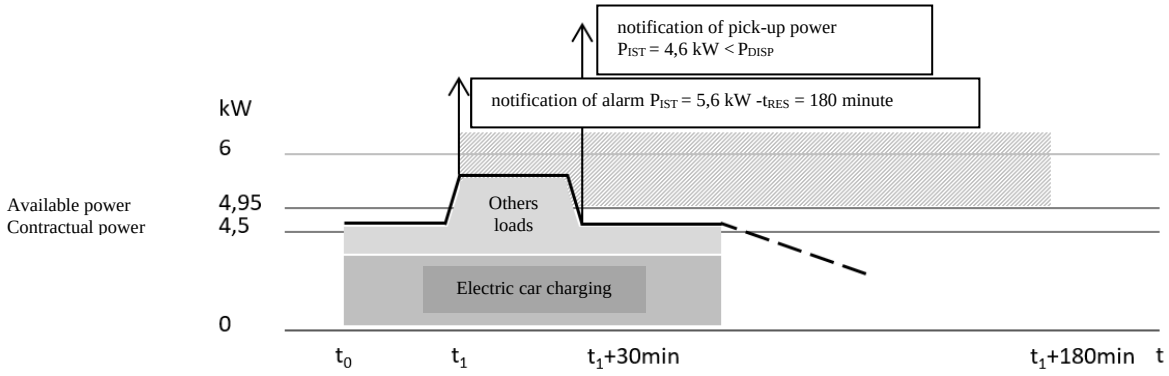

Figure X3 – Exemplification of sending signals from 2G M1 smart meter on the Chain 2 channel in the event of exceeding available power

The CIR device in this case would be able to maintain the power of the charging infrastructure initially set. Otherwise, CIR will intervene by reducing the charging level within the time limits notified through Chain 2 channel, protecting the user from the intervention of 2G smart meter limiter. CIR shall take action by maintaining always an appropriate time margin before the instant when the limiter will trip.

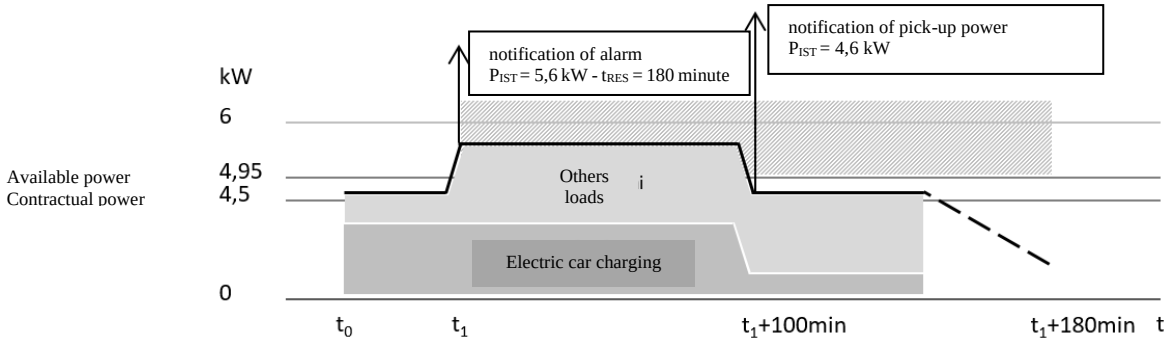

Figure X4 – Exemplification of sending signals from 2G M1 smart meter on Chain 2 channel in the event of exceeding the available power and subsequent intervention of the power management function in CIR

As specified in CEI TS 13-83, the information regarding the time remaining before the limiter trips is of an additional type and may not be supported by 2G smart meters of all DSOs. Should this information not be present within the alarm message, the CIR device would still be able to intervene immediately after notification to bring the total drawn power back below the available power.

For infrastructure with multiple charging stations, the designer/manufacturer is in charge of the definition of algorithms for allocating charging power among the different vehicles present.

In the automatic mode (see X.5.2, reducing the maximum power of the charging infrastructure sent by an RO and increasing or restoring the maximum power of the charging infrastructure), the charging current is instead fixed according to the commands coming from the enabled RO, complying with the constraint of the available power detected by 2G smart meter.

X.5.2 Reduction and restoration of power sent by an authorized external party (RO)

CIR must be able to implement commands from ROs that are received after a time interval of not less than Tatt from the last processed set-point (1). After Tatt has elapsed, CIR must ensure a reaction time from receipt of the next command that does not include intentional delays, is setable, and set by defaults to 1 second. Restoration of the maximum power of the available charging infrastructure may occur automatically after the expiration of the time period for which the reduction was programmed, or upon the sending of a new message with different maximum power of the charging infrastructure that overwrites the current set-point. The electrical quantities sent by CIR to RO are listed in X.7.1, "Electrical parameters managed by CIR."

NOTE 1 Update commands that are received with time intervals of less than Tatt must be held and then transferred after that Tatt time interval has expired.

X.5.3 Operating conditions in under-frequency events

In the under-frequency regime, CIR shall be able to interrupt any charging cycle in progress and send a command to EV charging station to suspend charging the electric vehicle.

The charging suspension command must be implemented:

- for exceeding under-frequency threshold values adjustable between 47.5 to 50 Hz (default of 49.5 Hz) or for exceeding a randomly determined frequency threshold (2) in the range of 47.5 to 49.5 Hz;
- before the execution of commands for the provision of ancillary services.

When the frequency returns to the 50 ± 0.05 Hz band for a minimum continuous time of 300 seconds (default setting, time setable between 1 to 900 seconds with 1-second resolution), CIR must interrupt the request to suspend charging by restoring normal operation of the previously interrupted functionality in 2 steps of power modulation:

- the first step provides 50% of the maximum value between the power of the charging infrastructure absorbed before the standby command and the minimum charging power of the electric vehicle for a period of 5 min;
- the second step provides 100% of the power of the charging infrastructure absorbed before the stand-by command.

NOTE 2 The suspension at a random frequency is motivated by the need to achieve a gradual power change in the electrical system.

X.5.4 Characteristic times for the control functions of the CIR

As for the local power management function, the control functions must act with such timing as to prevent the limiter tripping of M1 meter. Therefore, CIR should be able to process the limiter tripping warning signal for exceeding the available power sent by 2G smart meter via "Chain 2" and should take timely action to reduce the overall drawn power at the delivery point.

For the provision of ancillary services, the regulation function must have timing consistent with:

- car limitations: set point variation not more frequent than Tatt;

- information on the power exchanged at the delivery point from M1 through Chain 2 when available, with an interval of 1 minute from the last communication sent, or immediately if there is a drawn variation above a certain threshold, e.g. +/- 0.3 kW.

X.6 Facility management and provision of ancillary services

Ancillary services are provided in the manner described in X.7.1.1 by executing commands of the type described below:

- reducing the maximum power of the charging infrastructure;
- increasing or restoring the maximum power of the charging infrastructure.

X.7 Technical characteristics of the CIR

The functional requirements related to communication between CIR and RO, 2G meter and charging station are given in this subclause.

The description of use cases related to CIR - RO communication is given in X.8.

X.7.1 Electrical parameters managed by CIR

X.7.1.1 Between CIR and RO

The communication between CIR and RO is aimed at managing the information indicated in the following subclauses.

CIR receives instantaneous active power data from 2G smart meters, which make them available in the internally implemented manner. Once the data are received, CIR must be able to acquire them, process them and implement any necessary functions within 1 second.

X.7.1.1.1 From CIR to RO:

- Instantaneous active power of charging infrastructure (from Charging Infrastructure)
- Instantaneous active power drawn from 2G smart meter (M1)
- Instantaneous active power input(*) from 2G smart meter (M1)
- Instantaneous active power generated, if available(*) by 2G smart meter (M2)
- Electric vehicle related status: "connected and charging"/"connected and not charging"/"not connected"/"abnormal behavior" (from Charging Infrastructure)
- Time remaining before limiter disconnection (**)
- Time relative to the measurement taken, from 2G smart meter (M1).

(*) Available as additional data in case of a prosumer-type user with P6 or P7 profile as per CEI TS 13-82.

(**) Available as additional data as per CEI TS 13-82.

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X.7.1.1.2 From RO to CIR:

- Maximum power of the charging infrastructure of X,xx kW for Y minutes (***)
- Maximum power of charging infrastructure of X,xx kW until hh:mm (***) (****)
- "Charging suspension command" for "Y minutes" (***)
- "Charging suspension command" "until hh:mm"(****)

(***) With X,xx greater than or equal to a certain value, such as 1.50 kW, and Y greater than or equal to 1 minute

(****) hh = hours (00-24), mm = minutes (00-59)

The two power signals, as well as the two suspension commands, can be used alternatively or jointly. If the two power signals or the two suspension commands, sent jointly, are not congruent, the one with lower power and/or longer duration must be implemented.

X.7.1.2 From smart meter 2G (M1) to CIR

Communication from smart meter to CIR is aimed at sending the following information:

- instantaneous active power drawn
- instantaneous active power fed in (*)
- time remaining before limiter disconnection (**)
- available power
- frequency: accuracy for frequency measurement not less than ± 50 mHz (in case the frequency information is not made available by the 2G smart meter (M1), frequency measurements can be acquired by a dedicated measurement system installed immediately downstream of the delivery point or in the charging station. In case the frequency information is not made available, the mode described in X.5.3 may not be operated)
- time related to the measurement made

(*) Available as additional data in case of a prosumer-type user with profile P6 or P7 as for CEI TS 13-82

(**) Available as additional data as per CEI TS 13-82.

X.7.1.3 Between CIR and EV charging station

Communication between CIR and EV charging station is aimed at sending the following information:

X.7.1.3.1 From CIR to EV charging station:

- command to suspend charging of the electric vehicle
- value of the maximum power that the Charging Infrastructure can draw from the grid to charge the electric vehicle

X.7.1.3.2 From EV charging station to CIR:

- instantaneous active power of electric vehicle charging
- status related to the electric vehicle: "connected and charging"/"connected and not charging"/"not connected"/"abnormal behavior"

In case there are multiple charging points in the infrastructure, the indicated information should be provided for each of them.

X.7.2 Communication interfaces

This section defines the communication interfaces between CIR, 2G meters and RO.

The communication interfaces between CIR and CSMS (Charging Station Management System) of the CSO (Charging Station Operator)(1), User Interface for configuration and maintenance, charging infrastructure and CEM, are out of the scope of this Annex but can be implemented in the manner deemed most appropriate by the manufacturer.

NOTE (1) For the purposes of this Annex, the term CSO is equivalent to the term CPO (Charging Point Operator).

X.7.2.1 Communication interface with 2G smart meters

The communication interface with 2G M1 and M2 smart meters is defined by the following standards:

- CEI TS 13-82 "Electricity metering systems - Communication with user devices - Part 1: Use cases"
- CEI TS 13-83 "Electricity metering systems - Communication with user devices - Part 2: Data model and application level"
- CEI TS 13-84 "Electrical energy measurement systems - Communication with user devices - Part 3-1: PLC protocol profile in the 125 kHz - 140 kHz band (C-band)"

- CEI TS 13-85 "Electrical energy measurement systems - Communication with user devices - Part 3-2: RF protocol profile in 169 MHz band"
- CEI TS 13-90 "Electrical energy measurement systems - Communication with user devices - Part 3-3: Narrow Band IoT protocol profile"

X.7.2.2 Communication interface to RO

The communication interface for data exchange with RO is based on the eXtensible Messaging and Presence Protocol (XMPP) [1].

The XMPP protocol is defined by the following documents issued by IETF (Internet Engineering Task Force):

- RFC 6120

- RFC 6121

- RFC 7622

The specifications of CIR-RO protocol layers are given in X.8.

X.7.3 Cybersecurity

It is required that communications between CIR and RO implement cybersecurity measures to ensure confidentiality, integrity, non-repudiation of transmitted data, authentication of "end points" and security of systems and equipment. In detail:

- end-to-end security of information exchanges must be guaranteed: communications must be encrypted and authenticated. Mutual authentication of "end nodes" is also required. In particular, depending on the communication protocol adopted, the reference standard (e.g., IEC 62351, TLS (Tranport Layer Security)) must be applied to the appropriate ISO/OSI layer (application, transport, network) by implementing the required security profiles and minimum configuration parameters (e.g., TLS v1.2, SHA 256, RSA 2048 bit key length or ECC 256 bit);

- an infrastructure must be properly implemented to enable the creation, management and revocation of certificates used for both authentication and authorization;

- an infrastructure for managing application access based on differentiation of permissions according to assigned roles must be implemented. Each entity must be associated with one or more roles with certain privileges on objects;

- management of access credentials;

- appropriate measures of traffic and communication port segregation.

Specifically:

- data confidentiality: is provided by the TLS procedure of the chosen protocol, which is an ISO/OSI Transport Layer encryption mechanism and is used to:
  - ensure the confidentiality and integrity of the data;
  - prevent tampering and eavesdropping of the information flow and thus possible forging;
  - prevent password sniffing, man-in-the-middle and replays attacks, insertions, deletions and modifications of an XML stream;
- data integrity: is provided by the TLS procedure of the chosen protocol.

[1] The use of the XMPP transport protocol ensures the scalability, modularity and flexibility required by the large number of Charging Infrastructures to be controlled.

X.7.4 Data logger

As part of its functions, CIR must ensure that communication with RO, EV charging station and 2G smart meter takes place in the prescribed manner and time. If CIR is unable to execute commands or exchange information with the above parties, it must ensure that such malfunction events are logged in a special non-volatile memory area and maintained there for at least 60 days. The event log must be accessible from the outside via appropriate interface and allow for a clear determination of the reasons for the malfunction and its timing afterwards. CIR must also record information about any malfunction states of CIR itself and include its power-up, restart, shutdown, update and cybersecurity activities. If there are no malfunctions, CIR shall report on the event log its correct operating status every 15 minutes.

X.8 Requirements of CIR - RO communication interface

CIR-RO communication is based on the protocol stack shown in Figure X5

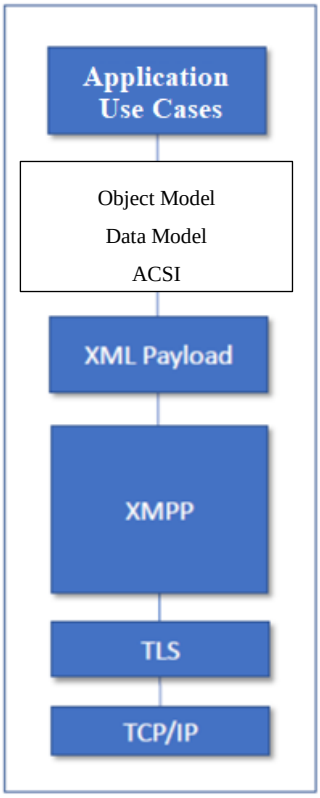

Figura X5– Protocol stack for CIR-RO communication protocol

This section identifies and describes the key aspects of use cases to be considered for CIR-RO communication. For the complete definition of use cases, data model, communication and cybersecurity protocol, messages and conformance testing, see CEI PAS 57-127.

X.8.1 Protocol functions

The communication protocol between CIR and RO must allow the data exchange reported in X.7.1.1.

X.8.2 Use Cases

Use cases related to the protocol between RO and CIR can be found in CEI PAS 57-127.

X.9 Tests

Tests to be performed on CIR to verify its compliance with this Annex are:

a) functional tests corresponding to CIR -RO communication according to each use case given in X.8;

b) functional tests corresponding to 2G smart meter to CIR communication as reported in X.7.1.2; and

c) cybersecurity-related tests corresponding to the functions described in X.7.3.

For the complete definition of the test procedures in a, c, see CEI PAS 57-127.

For the complete definition of the test procedures under b, see the provisions for the User Device in CT 13.

Functional tests corresponding to communication between CIR and charging infrastructure, as reported in X.7.1.3, are not covered by this document. However, the Manufacturer shall indicate in its documentation which charging infrastructure is compatible with its CIR.

CIR shall be CE marked. In addition, to meet the insulation, environmental and electromagnetic compatibility requirements related to the specific installation environment, it shall be tested according to the relevant standards.

If CIR is implemented as an integrated feature in other installation elements (e.g., charging infrastructure), reference shall be made for the insulation, environmental and EMC tests to what is already provided in the product standard for the installation element under consideration.

Compliance with the requirements listed in the previous points shall be attested by "Declaration of Conformity" of the equipment. This Declaration of Conformity shall be issued by and under the responsibility of the Manufacturer, in the form of self-certification by the Manufacturer, drawn up in accordance with Clause 47 of Presidential Decree No. 445 of December 28, 2000, and shall be made available by the User to the DSO at the time of connection.

The documentation proving that the tests (test reports) have been passed shall be kept by the Manufacturer for at least 20 years from the last production. However, the same documentation shall be made available to the DSO by the Manufacturer on its website.

The Declaration of Conformity of the equipment shall contain all the information necessary to identify the device.

The performance of the environmental compatibility tests (isolation, climatic and EMC tests) provided shall take place at a laboratory accredited according to CEI UNI EN ISO/IEC 17025.

Functional tests may alternatively take place:

a) at the above laboratory; or

b) at the manufacturer's laboratories, or external, non-accredited laboratories.

In the latter case (letter b), the tests shall take place under the supervision and responsibility of the appropriate certifying body that has the requirements of UNI CEI EN ISO/IEC 17065 or, alternatively, under the supervision and responsibility of the accredited laboratory at which the EMC tests were done.

An attestation shall also be made available that the production of the device is carried out under a quality regime (according to ISO 9001, ed. 2000 [as amended]). This attestation shall likewise be issued under the care and responsibilitỳ of the Manufacturer and shall be delivered, upon request, by the User to the DSO upon connection.

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