Quality Assurance Plan (QAP)
of Charging Interface Initiative e.V.

CharIN Conformance Testing of Charging System

V1.0

10.07.2023

Charging Interface Initiative (CharIN) e.V.
c/o innos GmbH
Kurfürstendamm 11
10719 Berlin Germany

Contact
André Kaufung
Phone +49 30 288 8388-0
Fax   +49 30 288 8388-19
Mail   coordination@charin.global
Web   www.charin.global

Table of Contents

1. Introduction

More universal items EV and EVSE become, worse charging issues the customer might have, if there is no effort to increase interoperability. Many standards and technical requirements for charging have been delivered to the market, but perfect standards are existed in only the ideal world. Even if the perfect standards are assumed, they specify NOT what EV and EVSE don't have to behave but what EV and EVSE have to behave for charging so that the different interpretations between stakeholders such as EV OEMs, EVSE manufacturers, testing houses, CPOs, always happen in the field. This is the main reason of the interoperability issue.

Testing is one of the best resolutions to improve interoperability and two options can be proposed:

- Interoperability test

- Conformance test

In this document, interoperability test is defined that testing of EV directly against each EVSE and vice-versa is fulfilled to reach a full interoperability for all EV and EVSE. This approach requires organizing a snap-shot event like CharIN testival or international testing symposium, In terms of cost and time, it is feasible for the selected EV and EVSE model types.
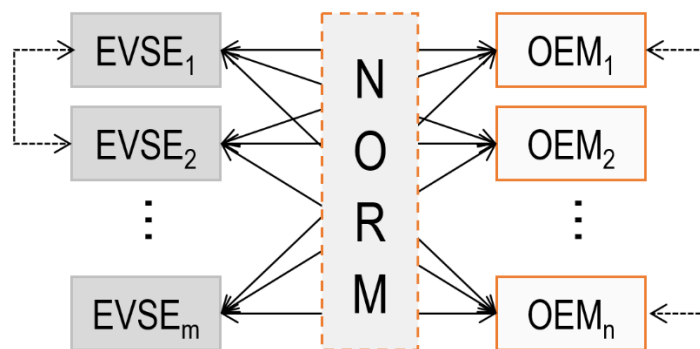
Figure 1. Interoperability testing concept

In the case of conformance test, the testing of EV and/or EVSE against testing system, which simulates the counterpart as NORM, is executed according to test cases of test specification. As a distributed scheme, this manner can bring cost and time saving by adopting self-evaluation by OEMs, manufacturers, service providers as well as independent testing by 3rd party testing house. In other words, the conformance

testing can be carried out at any time in any place. The level of the conformance testing is determined by two factors:

- Test Specification Development: How to develop test cases and specification.
- Quality Assurance Plan: How to qualify testers and testing systems.

In the end, the conformance testing is one of the most feasible solutions to ensure safety and interoperability. Especially, in case that the conformance test is performed as a part of type test for EV or EVSE, it will be the cost-effective way to improve the interoperability of CCS EV charging system. Once EVSE is installed in the field or EV is released to the market, the operator might fight for enormously increased cost to fix the interoperability issues, which are found from customer experience.
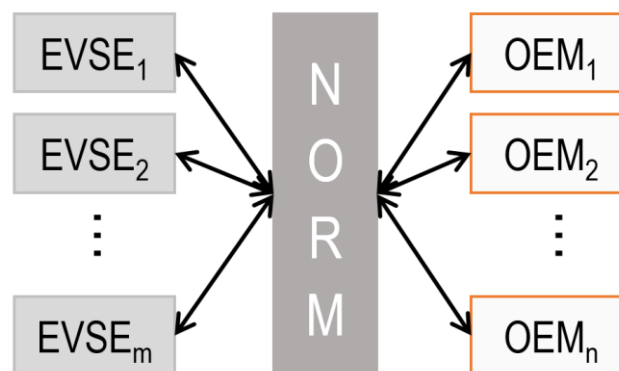
Figure 2. Conformance testing concept

In this document, as a method to make assure high level of the conformance testing, the process of quality assurance plan will be introduced for CharIN members to be aware of it, since it should be operated with impartial and transparent manner. This means that any CharIN member can expect the next step of the conformance testing and come into the conformance testing group. All the activities according to the conformance testing process in this document is bringing the common benefit for every CharIN members, stakeholders and the market. On the purpose, this document will keep being edited upon the request of members.

2. Scope

The purpose of this document is to describe the specific way about quality assurance plan for the conformance testing, which executes test cases defined in CharIN specification (application profile) [4]. For this:

- Conformance testing: activities for the supply chain between EV OEM/EVSE manufacturer and Customer
- Tool Validation: activities for the supply chain between tool vendor and tool customer such as testing house, EV OEM, EVSE manufacturer, Service operator, ...
- Recognition (Assessment) : activities for the supply chain between testing house and testing service customers such as EV OEM, EVSE manufacturer, ...
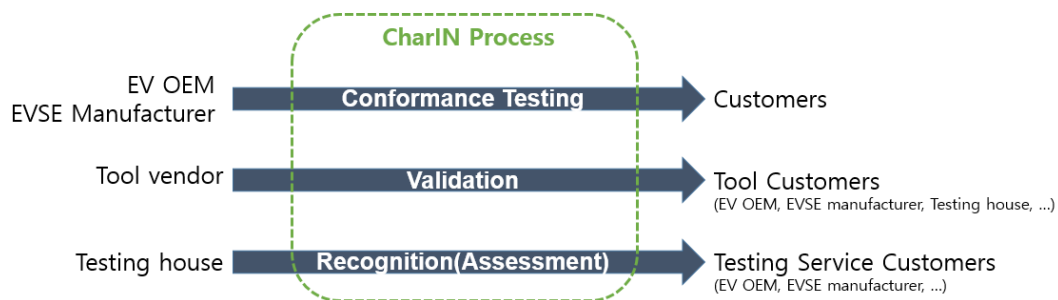
Figure 3. Supply chain and activities

CharIN test certificate for conformance testing can be issued only by CharIN recognized testing house with CharIN validated CCTS. After the successful completion of recognition and validation, CharIN approves and provides labels of "CharIN recognized testing house" and "CCTS", respectively.
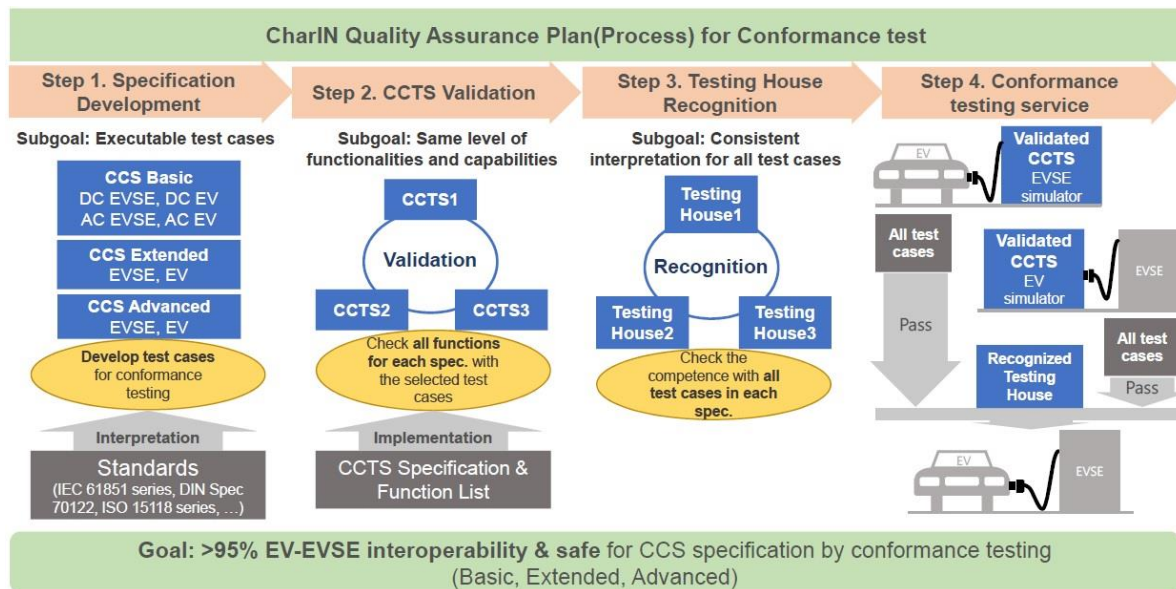
Figure 4. CharIN quality assurance plan (big picture)

For this commitment, CharIN organizes the governance structure for CCTS validation as well as testing house recognition. PAC (Peer Assessment Committee), which is the main actor to execute the main activities. It is established to evaluate the competence of testing house and the capability/functionality of CCTS under the name of CharIN.

The main objective of CharIN QAP is to achieve >95% EV-EVSE interoperability and safety by the conformance testing for happy charging experience of users.

With these objectives, the present document

- Defines governance, roles and responsibilities of the entities, which CharIN global conformance testing scheme is composed of: CharIN governance, the concept of interoperability testing and certificate committee, peer-assessment committee, testing house, tool vendors, assessors.

- Specifies how to evaluate the competence of testing house as the recognition process of testing houses including assessment scheme, criteria, process detail with expected schedule, re-recognition process.

- Gives how to validate the functionalities and capabilities of testing system under the name of validation of CharIN conformance testing system (CCTS).

- Provides the information how the technical expert pool is managed as assessor and what is required to join the expert pool.

- Describes when CCS product need to carry out re-test and what tests are considered upon the declaration of product manufacturer in the part of validity of test certificate.

- Introduces the fast-track process to edit test cases as the resolution of issues found and reported during the conformance testing (TBD).

Upon the request, this document will be revised to cover the problem and also focus on the common process of the conformance testing to be relevant to all levels of CCS step model; CCS Basic, CCS Extended, CCS Advanced. All technical element is coming from the references.

3. Terms and definitions

3.1. General terms

Assessment

Activities to evaluate whether the applicant testing house has the competence and internal quality assurance system to execute test cases of CharIN specification as well as to interpret the test result consistently.

CCTS validation

Activities to confirm whether the applicant CCTS (solution) can provide the compliant capabilities or functionalities defined by the specification.

Conformance testing

Testing or other activities that determine whether EV or EVSE complies with the requirements of a specification given by CharIN.

Recognition

The whole process or activities to accept the applicant testing house as CharIN testing house.

3.2. Abbreviation terms

The following terms and definitions are indispensable for the application of this document.

CCS	Combined Charging System
CCTS	CharIN Conformance Test System
CT/IOP	Conformance Test/InterOPerability
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
FG	Focus Group
HPC	High Power Charging

IOP	InterOPerability
ITCC	Interoperability Testing and Certification Committee
OEM	Original Equipment Manufacturer
PAC	Peer-Assessment Committee
PCAP	Packet CAPture
PICS	Protocol Implementation Conformance Statement
QAP	Quality Assurance Plan
SUT	System Under Test

4. References

[1] ISO/IEC 17025:2017

[2] ISO 9001:2015

[3] CharIN Implementation Guide for CCS Basic, latest version

[4] CharIN Conformance Test for DC CCS Basic EVSE, latest version

[5] CharIN DC CCS Power Classes, latest version

[6] CharIN CCTS Specification, latest version

[7] CharIN CCS design guide for CCS

[8] CharIN Guideline DC CCS 1.0, latest version

[9] CharIN function set CCTS, latest version

5. Governance, Roles, and Responsibilities

5.1. Governance

CharIN was established to develop and to establish CCS as the global standard for charging battery powered electric vehicle, and its mission is described as bellows:

- Expanding the global network by integrating companies on each level of the defined value chain to support and promote CCS

- Drafting requirements to accelerate the evolution of charging related standards

- Defining a certification system for all manufacturers implementing CCS in their products

Upon the third mission, CharIN is working to promote the adoption of interoperable products and services of the various member organizations. CharIN has five expert groups named Focus Group, and divided as followed:

Charging Infrastructure
- Harmonization of the ramp-up of CCS charging infrastructure and the involved charging process based on the market needs: removing market entry barriers for EV owners, charge point operators and manufacturers
- Product Lifecycle Management perspective on CCS

Charging Connection
- Harmonize and discuss future developments of Combo coupler for AC and DC charging according to IEC61851 / IEC 62196 / SAE 1772 as a part of the CCS.Clamp and synchronize charging technologies for the CCS system as a common CCS development roadmap.
- Develop synchronized recommendations in alignment with the CCS step model for standardization parties.

Charging Communication
- Support of development, specification and test of charging communication
- Close gaps and provide recommendations for communication protocols of the electric vehicle (EV) charging system

Grid Integration
- Identification of technical issues
- Harmonization of approaches between the involved industries
- Evaluation of technical and economical potentials
- Definition of consolidated statements and requirements for grid integration with the end user's view in mind

Conformance Test / Interoparabilty
- Agree on requirements for CharIN CCS Test System (CCTS)
- Define processes on how to qualify CCTS, agile IOP, test houses, EV and EVSE based on the different compliance levels and profiles
- Interoperability of customer use cases beyond scope of CCTS (e.g. authentication sequence)
- Maintenance of CCTS Specification (HW, SW, Test Cases)
- Definition of a vendor-neutral CCTS specification which is compliant with CharIN

Figure 5. CharIN Focus Groups

Among them, FG CT/IOP has the responsibility to assure maintenance of a viable conformance and interoperability test program for CharIN members. FG CT/IOP consists of three teams named as Qualification team, Development team and Vendor team. This part of the document describes the governance, Role and Responsibilities of CharIN itself, FG CT/IOP and each of the teams.

In order to achieve a better level of interoperability of EV charging system, CharIN is building up the conformance testing program with the documented quality process and defining the required entities for the conformance testing program. Interoperability Testing and Certification Committee (ITCC) is to govern and surveil all entities' activities with under the purpose that this program guarantees the minimum interoperability through the same technical interpretation between testers, manufacturers, and other stakeholders. Please note that CharIN of this document means not directly CharIN Coordination Office but the member-empowered association.

Figure 2 depicts the organizational frame of CharIN conformance testing program and shows the brief role and relations between entities. This program requires 4 different entities: CharIN – ITCC, Testing House, CCTS Vendor, and Assessor. The definition, and roles and responsibilities and relation between the entities are described in the following sections.
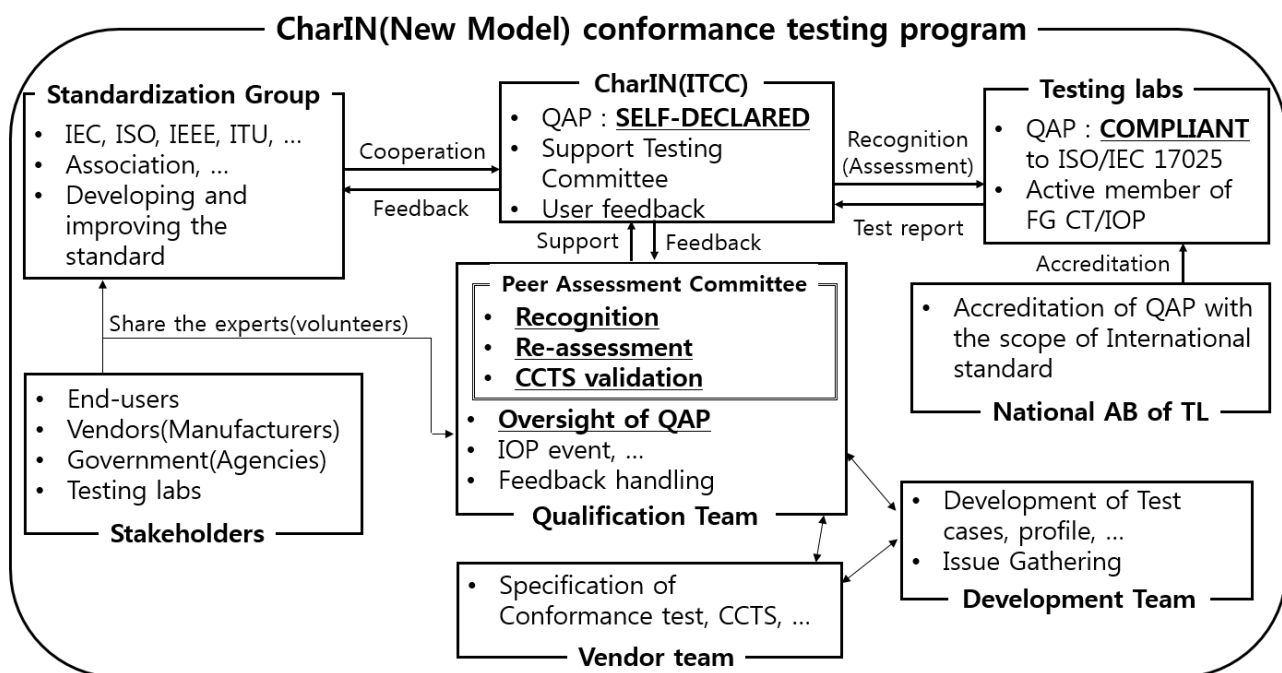

Figure 6. Organizational frame of CharIN conformance testing program

5.2. CharIN - Interoperability Testing and Certification Committee (ITCC)

CharIN – ITCC, is the program management entity providing for day-to-day operation, oversight for the conformance testing activities, such as testing, recognition of test houses, assessment of test houses, and validation respectively recognition of CCTS, associated with one or more related standards, specification, test cases or implementation guideline.

It takes responsibility to ensure that interoperable products within the scope of this testing program are brought to market. CharIN coordinates the participation or recognition of testing houses. Now, this conformance testing program is not as big as to require the activities of the certification body, but in the future, CharIN could introduce 3rd party certificate bodies and distribute the part of testing program roles to them for providing more efficient and accessible service to the market.

The ITCC shall consist of the Focus Group Speaker, deputy speaker, the team leads, and the deputy team leads and the at least 1 person from the CharIN coordination office.

In the summary of the conformance testing process, CharIN as ITCC has duties of,

- Coordinate, cooperate and support all teams' activities
- Implement QAP for the conformance testing based on this document
- Handling user feedback from CharIN members, customers of this testing program, experts, the standard organization, and other stakeholders
- Resolve disputes arising from CharIN conformance testing program
- Approve the recognition of testing houses

According to the internal policy of CharIN, some of decisions for the testing process should be managed CharIN Coordination Office and require the agreement by Steering Committee of CharIN.

5.2.1. FG CT/IOP Qualification Team

FG CT/IOP Qualification Team's main role is the QAP development and maintenance. For this work, Qualification Team will fulfill to develop the process related to,

- Oversight work on QAP to assure high-quality of the conformance testing
- QAP document management

- Validation of CCTS
- Management of technical expert pool
- Feedback handling arising from conformance testing
- Planning and execution of technical events, such as IOP and proficiency testing if needed
- Interpret QAP program for all members and teams
- Publishing testing guidelines and decision sheets

The detail processes about the above works will follow in this QAP document. If the additional process is required, it could be added.

The Qualification Team is an open committee so that any members of CharIN can join.

5.2.2. Sub-committee of Qualification Team – Peer Assessment Committee (PAC)

The PAC, as subgroup of Qualification Team, is a specialized committee to manage peer assessment. The detail activities of PAC are described in Part 6; Recognition of Testing Houses. Please note that all activities of PAC shall be transparent to Qualification Team and FG CT/IOP.

PAC is composed of Chair, Vice-chair, and members. PAC is also open committee, so any CharIN members can join the PAC. For peer assessments, the technical experts, called as assessors, shall be invited from technical expert pool. More details are described in Part 10. Any experts of CharIN members listed as technical expert, is eligible to join PAC. CharIN recognized testing houses; have the duty to join PAC by means of contributing at least one lead assessor. Additionally, at least one person from CharIN CO should join PAC.

If without other objections, Focus Group CT/IOP Qualification team Leader and deputy leader take the role of Chair and vice chair of PAC, respectively. With some reasons, if the team leader and deputy leader are not available for chair and vice chair, one or both is(are) constituted by electric voting of FG CT/IOP members upon recommendation for a candidate; 1 voting for 1 company.

The candidates shall have been PAC member for the past 1 year at least[1] and are recommended by any of FG CT/IOP members as well as PAC members. If one candidate achieves a major of the valid voting, this

---

[1] In the stage of establishment, the candidates of chair can be constituted from any of FG CT/IOP members. (If chair and vice chair are appointed, please remove this note.)

candidate is appointed as chair of PAC by CharIN CO. The appointment is valid for 3 years if the appointed person doesn't request to quit. In order to keep the continuity of peer assessment scheme, the re-appointing process of chair and vice chair shall be initiated when the appointed term of them is ended, and it shall be completed when the appointed term of other chair is remained to 16 months[2]. For instance, the re-appointing process of PAC chair shall be initiated right after 3 years from the appointing and finished before the appointed term of vice chair is remained to 6 months. While the re-appointing process, the other chair shall cover the work of PAC if required.

This appointment process is finalized by the confirmation of CharIN CO. When there is a critical issue to harm the impartiality or fairness on the process, CharIN CO can deny or revoke the current appointment with a clear reason. Then, CharIN CO and the other chair, who is under its effective term, shall arbitrate with PAC. If PAC accepts the decision of CharIN CO, the re-appointing process shall be initialized right away.

The duty of chair and vice chair can be summarized as follows:

- Conduct the teleconference to confirm the assessment plan and the final review related to testing house recognition, re-assessment, and CCTS validation
- Monitoring the assessment process
- Organize the initial assessment team
- Get and consolidate the feedback from PAC members
- Remark the final verdict on the review result from the assessment team
- Make the round-robin table to select assessors for the upcoming assessment and validation from human resource pool
- Issue handling among PAC, FG CT/IOP, and CharIN CO

Regarding job assignment of the above duties to chair and vice chair, it depends on the way that they confer and agree.

5.2.3. FG CT/IOP Development Team

Development Team of FG CT/IOP is the core source of the technical support and take jobs of:

- Development and maintenance of test package documents related to the conformance testing, such as "CCS Basic EVSE", including CCTS validation
- Gathering and analyzing of the field interoperability issue
- Creation of the technical guideline, if required

The technical document created by Development Team will be listed in the [umbrella document, under development].

Development Team is also opened to any members of CharIN can join.

5.2.4. FG CT/IOP Vendor Team

Vendor Team of FG CT/IOP is composed of CCTS vendors, who are the manufacturers as well as the providers. CCTS is the heart of the conformance testing program, and CharIN assures the basic capability and the functionality of CCTS through the validation. On the technical scope of the conformance testing, Vendor Team get the job assignment of,

- Development and maintenance of the conformance testing system specification
- Development and maintenance of CCTS related template, such as Unified test report format
- Development and maintenance of testing system part technical documents for CCTS validation

Vendor Team deals with all items deal for the common benefit rather than items related to one specific of CCTS.

5.3. CharIN Testing House

The objective of CharIN throughout the conformance testing is to provide the compliant products to the requirements of testing package and the international standards. In order to implement it, the interpretation and verdict of the conformance test result against the same SUT shall be consistent between testers and testing houses, and this is the most important factor of QAP. For this perspective, CharIN allows performing the conformance testing only by CharIN recognized Testing Houses. The detail recognition and re-assessment plan will follow in part 6.

CharIN (Recognized) Testing Houses take the role of

- Performing the conformance testing

- Test report publication

- Reporting technical issue during the conformance testing to CharIN FG CT/IOP Qualification Team

- Becoming PAC member for peer assessment

- CCTS Validation testing

- Issuing CharIN Test Certificate

- Participating every CCTS testing event as witness

Table 1. Job assignment of the main entities in QAP

CharIN (ITCC)	PAC	Testing House	CCTS Vendor
• Coordinate, cooperate and support all teams' activities • Implement QAP for the conformance testing • Feedback handling • Resolve disputes • Approve the recognition of testing house	• Conduct the telco related to assessment • Monitoring the assessment process • Organize the initial assessment team • Feedback handling • Remark the final verdict of the assessment • Make the round-robin table of assessors	• Conformance testing • Test report publication • Testing issue report to PAC • Duty as PAC member • CCTS validation testing • Issuing CharIN Test Certificate	• CCTS Development • Providing CCTS • Maintenance CCTS • CharIN CCTS specification development and maintenance • Support CCTS validation process

5.4. CCTS Vendors

The CCTS is the fundamental tool for the conformance testing, it's functionality and performance is directly connected to the testing quality. During the conformance testing, every tester will depend on the information, created by CCTS, about SUT for the final verdict of test case. In order to prove the functionality and capability of testing system, the vendor shall commit to validate it by CharIN process, and then vendors can officially name it on CCTS. At this point of view, CCTS vendors take the role of,

- Being a member of vendor team in FG CT/IOP

- Becoming PAC member for peer assessment

- Participating every CCTS testing event

- The development of CCTS

- Supplying CCTS to CharIN member and other stakeholders

- The maintenance of CCTS

- Developing and maintenance of CharIN CCTS Specification (Function list)

- Support the process of CCTS validation

5.5. Assessor

For all technical activities, such as the assessment, re-assessment of testing houses, CCTS validation, experts are required to evaluate the result. CharIN QAP defines these persons as Assessor with,

- The person(expert) to assess the technical competence of testing houses and tester

- The person(expert) to validate the capability, functionality, and basic performance of CCTS

Also, the job details are

- To analyze the test results, including unified test report from CCTS, trace files (PCAP), test log, measurement record

- To check the validity of verdicts from the test report or certificate of testing house

- To create, edit, and review the technical part of "Assessment report"

To prove assessors' ability and invite assessors with the impartial manner, CharIN will maintain "technical expert pool", as descripted in section 10.

Typically, assessment is performed in a team with 2 or more assessors. The team is headed by Lead Assessor. An assessor which has the required technical expertise and expertise in ISO 17025 shall preferably be a lead assessor.

5.6. Archive and access authority for testing house assessment and CCTS validation

All records, proofs and documentations created in testing house assessment and CCTS validation should be stored in CharIN conformance testing archive. CharIN CO is responsible for the preparation, operation and maintenance of this archive.

In those materials, the confidential information can be included so that the access authority to this archive is restricted to the designated persons; CharIN CO representative, Chair/Vice chair of PAC. They have the duty to protect all data as confidential. If necessary, they can open the part of the materials in the archive with the consent of stakeholders about testing house assessment as well as CCTS validation.

Anyone, who access this archive, shall be working under NDA (Non-disclosure agreement). CharIN CO representative, Chair/Vice Chair of PACs, and other designated persons must sign up on NDA form, which CharIN provides [A.12]. The signed NDA should be posted in archive folder.

6. Recognition of Testing Houses

6.1. Peer Assessment Scheme by PAC

PAC shall consist of experts with a good understanding of the requirements of IEC 61851 series, ISO 15118 series and or DIN 70121/22 and preferably ISO 17025. PAC shall be responsible for the planning and execution of the peer assessment upon applying of candidate CharIN testing laboratories. Peer assessment includes initial assessment and follow up assessment for the first recognition, re-assessment. PAC shall appoint a peer assessment team consisting of at least 3 experts, whereas one of the experts is nominated the lead assessor for initial assessments and the supporting assessors consisting of 2 experts. The assessor shall be referred to as Lead assessor, assessor A, assessor B.

PAC shall review each peer assessment files and make recommendations towards ITCC about the recognition of testing house if the review deemed the laboratory to be complying with the requirements. In case of differences between the parties, namely the candidate testing house and the assessment team, the chair or vice chair shall provide arbitration. The chair or vice chair may seek further advice from the ITCC if deemed necessary.

All PAC members shall be drawn from the technical expert pool and have signed the confidentiality and integrity pledge. Assessor shall sign the confidentiality commitment provided in the assessment planning before commencing their tasks.

6.2. Decision of the PAC

The PAC reaches quorum when two-thirds of its members take part in the decision-making process. Members may organize the decision-making process via meetings, telephone or videoconference The chair or vice chair may propose decision making by vote in writing, by fax or by e-mail – or by a combination of these means of communication – if no member of the PAC objects within a period of three days or within a reasonable period set by the chair or vice chair.

6.3. Criteria for Testing Laboratories

Candidate laboratories shall meet the following minimum criteria to be eligible to apply as recognized testing laboratory:

- Be a member of the CharIN association

- Shall have listed at least one technical expert(s) in "human resource pool" actively participating in the focus group conformance &IOP at least 6 months continuously

- Shall give at least one contirbution point(each of participating or taking a role, supporting can count one point.) such as

  - Participating CCTS testing event or CCTS validation, testing house assessment for one time as "Witness" or "assessor (reviewer)".

  - Co-work, giving contributions or taking a role of QAP development at least 6 months continuously

  - Participating qualification teams at least 1 year continuously before applying

  - Supporting the events organized by CharIN Focus Group

- Valid ISO 17025 accreditation issued by a National Accreditation Body or

- a valid ISO 9001 certification issued by a recognized Certification body and compliance with section 4-7 of ISO 17025

- Own CCTS(s) and relavant test case bundle(s)

- Submitted the completely filled in application form to the PAC

6.4. Recognition process of Testing House

Recognition of a testing house consists of an assessment of the organization against the general requirements in ISO/IEC 17025 or similar requirements, together with an assessment of technical readiness for performing CharIN testing. The technical readiness assessment is based upon review of laboratory

processes and procedures related to CharIN (QAP) as well as review of testing data respectively test report the laboratory has carried out on a charging station and Electric vehicle with the CCTS.

To become a CharIN testing house, it is required to present a QAP for the conformance testing and the competence of the testers with utilizing CCTS. CharIN is focusing on the testing competence. However, proof of competence shall be provided with

- Option A ISO 17025 accreditation
- Option B ISO 9001 management system certification including compliance with cl. 4, 5, 6 and 7 of ISO 17025
- And QAP documents which are related to CCS conformance testing and includes at least
    ✓ Training and qualification for technical personal involved in testing
    ✓ Maintenance and calibration for CCTS and associated equipment
    ✓ Validation of test setup
    ✓ Test report issuing procedure
    ✓ Audit plan against CharIN assessment and re-assessment
    ✓ Issue and feedback handling procedure during the conformance testing
    ✓ Any required documents and contents to execute the conformance testing by testing house

The recognition by assessment is valid for 3 years. In order to extend the Recognition of a testing house, there shall be bi-annual follow-up audit to ensure the continuity of the testing house's competences. The testing house shall submit and apply for re-assessment before the expiration date of the recognition[3].

To reduce cost, in principle, the remote assessment scheme is introduced. All assessment activities to check the competence of testing house are executed based on the electronic documents and technical proofs submitted by testing house.

6.5. Technical scope of Recognition

Testing house shall declare it's testing scope in terms of CharIN conformance test specification and power classes [5] as outlined below:

---

[3] Note: Before creating a QAP system for this testing, CharIN recommends that the testing house responsible reads CharIN QAP document.

CharIN conformance test specification [4]	Scope of Recognition certificate text
CharIN Conformance Test for DC CCS Basic EVSE[4]	DC CCS EVSE Basic recognized Testing house
CharIN Conformance Test for DC CCS Basic EV[TBD]	DC CCS EV Basic recognized Testing house
CharIN Conformance Test DC CCS Extended EVSE[TBD]	DC CCS EVSE Extended recognized Testing house
CharIN Conformance Test DC CCS Extended EV[TBD]	DC CCS EV Extended recognized Testing house
CharIN Conformance Test DC CCS Advanced EVSE[TBD]	DC CCS EVSE Advanced recognized Testing house
CharIN Conformance Test DC CCS Advanced EV[TBD]	DC CCS EV Advanced recognized Testing house

The competence of testing house shall cover the whole technical requirements of the declared CharIN conformance test specification. Each of the CharIN conformance specification requires independent technical assessment, and the assessment of the lower-level test package is necessary for that of the higher package. For instance, when the testing house applies to become CharIN testing house on "DC CCS Extended EVSE" test package, it shall also have the testing capability on "DC CCS Basic EVSE". The overlapped part between test packages needs to be assessed only once. A testing house can apply for 2 or more test package recognitions at the same time, however the assessment for each scope must be processed separately.

The testing house shall declare the power class it is able to support as per below table in combination with test package for example "DC CCS Basic EVSE" with "HPC 350".

After recognition, all technical scope of testing house is under the internal QAP of testing house according to ISO 17025 or ISO 9001. For this reason, when testing house utilizes a new or enhanced testing system for the conformance testing, there is no new assessment required. Only one condition is that it shall be the validated CCTS. Testing house shall provide enough proof in re-assessment. Specifically, for checking the maximum or minimum power class capability of test facility, the following documents shall be submitted:
-   Calibration certificate or measurement proof of CCTS by calibrated device showing compliance with specification

---

[4] Most of the conformance testing documents are under development by FG CT/IOP Development team.

- Test result of IEC 61861-23 to show the test facility power performance; "EVSE_DC_performance_check"
- Need to be discussed to add EV performance check

6.6. Recognition Procedure of Testing Houses

6.6.1. Exception

Regarding the initial testing house recognition about new CCS specification or technical scope, PAC can assess 2 testing house candidates or more at the same time because there is no recognized testing house. Then, still "peer-assessment" scheme is applied same as the below described steps.

For the case of the initial testing house recognition, in principle, all activities are assumed as "voluntary", but if some expenses are required, CharIN coordination office or PAC can claim to candidate testing houses as beneficiary.

6.6.2. Overview

The main recognition procedure is composed of 6 steps. This process maybe applied for initial application and scope extensions.
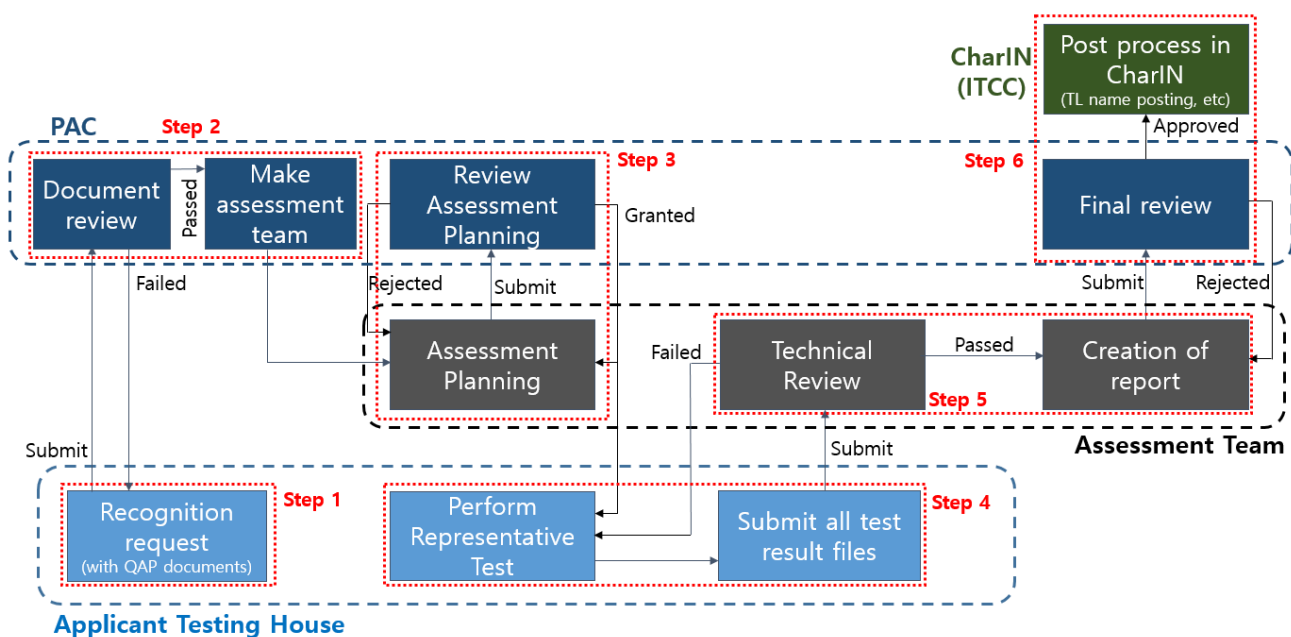

Figure 7. Flow chart of the recognition process

Step	Work	Work detail	Related entity	Process time
1	Submit application for recognition	Application form	Applicant testing house	-
2	Make assessment team and document review	Document review	PAC	2 weeks
		Organize assessment team	PAC	3 weeks
3	Assessment Planning	Create the assessment plan	Assessment team	3 weeks
		Review	PAC	2 weeks
4	Performing representative Testing	Submission of all test result files	Assessment team	3 weeks
5	Technical and quality review	Technical and quality review	Assessment team	4 weeks
		Creation of assessment report	Assessment team	2 weeks
6	Final Review and approval	Final review	PAC	2 weeks
		Approval	ITCC	-
	The whole process			Less than 21 weeks if there are no corrective actions

6.6.3. Step 1 – Submitting Application for recognition

The testing house shall fill in "Application for testing house recognition" in CharIN SVN folder (Annex A, SVN reference [A.1]) while indicating if the application is for an initial assessment, follow up assessment and or scope extension and submit the application form together with QAP of testing house to Chair and Vice-chair of PAC. They are the main contact persons and responsible for this application.

Chair and Vice-chair shall check whether the application is correctly filled in, and if complete move to step 2. In case of the first-time application the PAC shall confirm that the applicant meets the criteria's of section 6.2. If the criteria are met move to step 2 otherwise inform the applicant that the application is rejected due to not meeting the minimum criteria set out in section 6.2.

6.6.4. Step 2 – Document review and making assessment team

Upon accepting the application, the chair and vice-chair of PAC shall check the validity and completeness of the submitted documents. The required documents are, specified in "6.3. Recognition process of Testing House". If the whole document or parts of them are invalid or incomplete, the chair and vice-chair denies the testing house's application and informs the applying testing house of the reason for denying the application. In this case, the testing house must be given the possibility to correct and complete its documents and to re-submit again within 2 weeks. If testing house is not able to satisfy the requirements in 2 weeks, PAC shall treat this recognition application as "Failed" and "Closed", then PAC shall give "the review result of the submitted application" by utilizing the template in CharIN SVN folder (Annex A, SVN reference [A.2]), to the applicant testing house with the clear reasons. If the application documents are valid, PAC announces that the application is "Passed" to the testing house and moves on the next work, making the assessment team. The first document review shall be carried out within 2 weeks.

Once the assessment team has processed the submitted "Recognition Request" as "valid", PAC shall make the assessment team by inviting 3 assessors no later than 3 weeks. For this work, PAC selects three assessors from the technical expert pool

- One Lead assessor
- Two Assessors

Chair and Vice-chair should provide the recommendation of 3 assessors to PAC members as well as the announcement of a new assessment within 1 week from the submission of the application by email or teleconference. No name of the applicant testing house shall be exposed in the announcement. If there is

no objection from PAC members for the next 1 week, Chair and Vice-chair shall get a confirmation and send the official invitation to assessors. The lead assessor, takes a leading role of peer-assessment, shall come from the recognized testing house. The basic condition of the lead assessor is the experience of the conformance testing for more than 6 months as well as 2 actual testing.

If the invited assessors do NOT accept this invitation due to some reasons, PAC shall look for another assessor, but the consecutive rejection against the invitation from PAC is not allowed. Making assessment team shall be completed within 3 weeks from the application submission.

There is no strict rule for assessors' invitation, but Chair and Vice-chair should try to provide the even chance of the invitation in the assessors' pool. Additionally, the consecutive invitation of the same lead assessors on serial assessment should be avoided if there is no clear reason.

6.6.5. Step 3 - Assessment Planning

In this step, the assessment team shall begin planning the assessment. Based on the "Testing House Assessment report" format in CharIN SVN folder (Annex A, SVN reference [A.3]), the assessment team creates the initial testing house assessment report including a detailed assessment plan such as:

- assessor names
- scope of application
- document review result from step 2
- assessment schedule including
    - ✓ Technical review period by assessors
    - ✓ One day online session for Q&A about technical review results and quality assessment
- expected expenses.
- test case selection for representative testing according to "Testing house assessment_test case selection reference sheet" in CharIN SVN folder (Annex A, SVN reference [A.4])

The assessment planning document shall be sent to chair and vice chair for a review no longer than 3 weeks after the acknowledgment of document review result. The completed assessment plan should be sent to chair and vice chair of PAC and, then it is reviewed by PAC with the way that chair or vice chair organize the teleconference to deal with it. The review process should be no longer than 2 weeks. If PAC makes comments or rejects the assessment plan by a clear reason, the result should be returned to the assessment team without delay, and the team shall revise it within 1 week.

If the plan is granted, the applicant shall acknowledge the assessment plan and perform the representative tests whose result is supposed to be submitted in the next step.

6.6.6. Step 4 - Submitting the representative test result

Once the notice of the granted assessment plan is reached to the applicant, the applicant shall prepare submitting the assessment package consisting of documents related to assessment items as outlined below for technical review of the assessment team. The applicant shall submit:

- Test report document by utilizing the template in CharIN SVN folder (Annex A, SVN reference [A.5])
- Comment and analysis sheet of test results by utilizing the template in CharIN SVN folder (Annex A, SVN reference [A.6])
- Test report files created by CCTS
- PCAP trace files,
- Measurement records, (e.g., timing measurements, voltage measurement, current measurement etc.)
- Calibration report of CCTS
- photo proofs,
- other proofs, if any required.

All testing activities in the testing house – such as executing the tests, reviewing the result, and making the test reports – shall be carried out according to QAP of testing house.

In order to save time, the testing house can perform the representative test before receiving the notice of the assessment plan, and it means that testing house doesn't have the information of test case selection. However, the applicant may have to repeat the testing if the assessment team gives the comments by the technical review in the next step.

The submission of test result items shall be accomplished within 3 weeks after the notice of the assessment plan. If needed, testing house can ask the questions to the assessment team on carrying out the representative test.

As it is mentioned, remote and online assessment is the prioritized manner. But, if the assessment team concludes that the testing shall be witnessed on site, the lead assessor shall notify the applicant that an on-site witness testing is required, and it shall be agreed by the PAC beforehand (see step5).

6.6.7. Step 5 – Technical/quality review and creation of assessment report

After receiving the assessment package from the applicant, all assessors shall begin the review of it. This review is executed on remote in principle if there is no reason to witness and interview the testers at the moment. If there is the clear reason for on-site review raised by assessors, the assessment team shall forward the request to PAC. Upon the agreement by PAC, on-site review is feasible, and the cost planning should be following. All the cost shall be the part of the assessment plan later, but if the applicant rejects this on-site review plan, the assessment stops and is treated as "failed".

The assessment plan includes one day on-line assessment session to check the internal quality system of testing house applicant and ask questions found during technical review, execute the demo testing so that this session should be accommodated after technical review of each of assessor. For instance, after 3 weeks technical review, one day within the 4'th week could be selected based on the schedule agreement with assessors and testing house. While this on-line session, lead assessor shall confirm if quality system of the applicant is correctly declared by the submitted document. Also, assessors can ask any questions based on found issues from technical review and pick the test cases that testing house shall execute. Demo testing and responses against questions asked by assessors will be one of the most critical factors on the result of technical accreditation. But if required, during the review process the assessor(s) may reach out directly to the applicant to resolve issue arising during the review process. From the technical review, each of assessors creates and submits technical review report with "Testing house assessment technical review report format" in CharIN SVN folder (Annex A, SVN reference [A.7]).

The assessment team shall conclude the non-conformities (if any) upon the agreement of all assessors. If there is inconsistent review result or non-conformities between assessors, the lead assessor shall analyze and resolve it. If the leas assessor is not able be resolve the matter, the lead assessor shall forward the matter to the chair or vice chair of PAC for resolving.

The non-conformities shall be recorded in the testing house assessment technical review report and assessment report. Non-conformities would be related to technical issues or procedural issues. The lead assessor shall communicate the non-conformities to the applicant and provide 1 month for the applicant to resolve and response to the non-conformities with the corrective actions. If the applicant

When all non-conformities have been cleared the assessment team shall complete the assessment report based on the initial report and submit it to the PAC with one of the three recommendations and additional comments, if applicable:

- No. 1 The Assessment Team recommends **acceptance** of the assessed organization as CharIN Testing House
- No. 2 The Assessment Team recommends **acceptance** of the assessed organization as CharIN Testing House **subject to clearance** of the outstanding non-Conformity till the next assessment
- No. 3 The Assessment Team recommends that the acceptance of the assessed organization is **postponed** until a further **assessment** is carried out and is found satisfactory

It shall remain possible for the testing house to become recognized if some of the non-conformities are not cleared but they are of minor nature or related to process elements. In this case the assessment team may refer to recommendation No.2.

The assessment team may conclude that the assessed testing house does not meet the technical and procedural requirements or the organization is not able to resolve and response to the non-conformities in the agreed time frame in that case the assessment report shall recommend that the acceptance is postponed until a further assessment is carried out. Such a further assessment shall be carried out by a different assessment team (recommendation No. 3).

Throughout the technical review, the assessment team shall treat as "Critical issues" and then the assessment shall result into "the recommendation No. 3", when the below non-conformities are found:

- More than 3 incorrect verdicts of test cases
- Not calibrated CCTS
- Not calibrated measurement devices
- Not validated version of CCTS software and hardware
- Incorrect timing and measurement parameters for the testing
- More than 1 month for corrective actions of testing house against non-conformities
-

Other findings are reported as minor issues.

The technical review of the assessment team shall be completed no longer than 4 weeks after receiving the assessment package or receiving the corrective actions from testing house. Within this period, every assessor shall make the technical review with

- Overall review result
- Issue tracking: technical issues and corrective actions
- Comments and recommendation

When the technical review is finished, the review result document shall be shared in the assessment team, and the lead assessor shall announce the current assessment status to not only the chair and vice chair of PAC but also the testing house.

Based on the technical review result, the lead assessor shall create the assessment report. This report includes:

- Final verdict of the assessment; one of the above recommendations
- Executive summary of the assessment
- Summary of the granted assessment planning
- Consolidated technical review result of the assessment team
- The list of all submitted files from the testing house
- Procedure/Organizational comments, if any

The assessment report shall be submitted to chair and vice chair of PAC within 2 weeks after the technical review result from assessors are received.

6.6.8. Step 6 - Final Review and approval

The PAC shall make the final review of the assessment report and its accompanying documents. The review of the assessment shall be fulfilled by PAC within 2 weeks from the submission of the assessment report, and the teleconference organized by chair or vice chair of PAC is basically applied. At the moment, the applicant's name can be exposed to all members of PAC and CharIN members. If there is not issue found from the assessment report and the verdict is positive, the PAC may refer the applicant to the ITCC. The ITCC may issue the "Certificate of Recognition" as CharIN test house for the relevant scope.

6.6.9. Dealing with Information

PAC shall be responsible for the management of all pieces of information obtained from the testing house or created during the Recognition process. All pieces of information (e. g. test reports) are to be considered confidential, except if published by the testing house itself, or if the testing house and PAC, assessors agreed otherwise.

ITCC shall inform the testing house about Recognition certificate. Afterwards the testing house can request it on the CharIN homepage.

6.7. Re-Assessment Procedure of Testing House

6.7.1. Overview

The re-assessment process is composed of 6 steps.
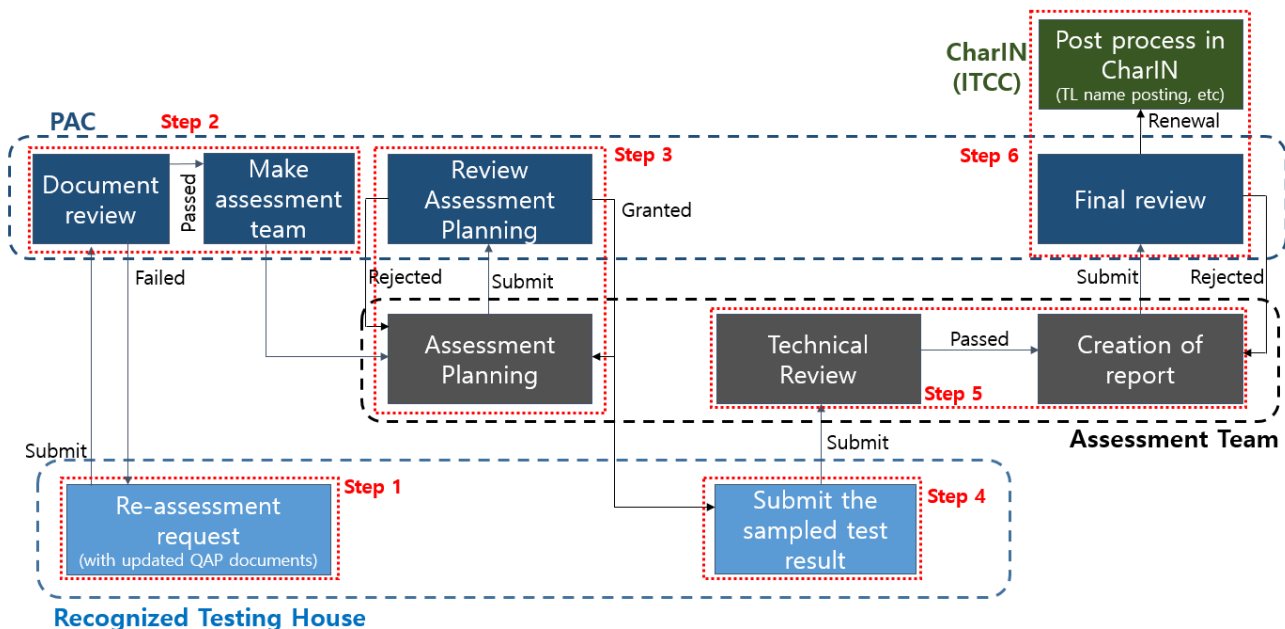
Figure 8. Flow chart of Re-assessment Process

Step	Work	Work detail	Related entity	Process time
1	Submit bi-annual assessment Request	Recognition request	Testing house	4 months Before the Recognition expired
2	Make assessment team and document review	Document review	PAC	2 weeks
		Organize assessment team	PAC	3 weeks
3	Assessment Planning	Create the assessment plan	Assessment team	3 weeks
		Review	PAC	2 weeks
4	Submitting the sampled test results	Submission of all test result files	Assessment team	1 weeks
5	Technical review	Technical review	Assessment team	4 weeks
		Creation of assessment report	Assessment team	2 weeks
6	Final Review and approval	Final review	PAC	2 weeks
		Renewal	ITCC	-
	The whole process			Less than 16 weeks if there are no corrective actions

6.7.2. Step 1 – Submitting re-assessment request

The re-assessment shall be initiated by the testing house, to further on keep being a CharIN recognized testing house. For this, the testing house shall request bi-annual assessment for the renewal of Recognition. The request shall be submitted at least 4 months before the expiration based on UTC. If the testing house doesn't submit anything, it shall be deemed that the testing house wishes longer to be CharIN recognized testing house.

The testing house shall fill in the "Application for testing house recognition" of CharIN SVN folder(Annex A, SVN reference [A.1]) and submit it to Chair and Vice-chair of PAC. They are the main contact persons and responsible for this application.

6.7.3. Step 2 – Making assessment team and document review

Upon accepting the application, the chair and vice-chair of PAC shall check the validity and completeness of the submitted documents. If any QAP documents have been updated since the Recognition or the previous audit, they shall be submitted as well. If the whole document or parts of them are invalid or incomplete, the chair and vice-chair denies the testing house's request and informs the applying testing house of the reason for denying the recognition request. In this case, the testing house must be given the possibility to correct and complete its documents and to re-submit again within 2 weeks. If testing house is not able to satisfy the requirements in 2 weeks, PAC shall treat this recognition application as "Failed" and "Closed", then PAC shall give "the review result of the submitted application" by utilizing the template in CharIN SVN folder (Annex A, SVN reference [A.2]), to the testing house with the clear reasons. If the application documents are valid, PAC announces that the application is "Passed" to the testing house and moves on the next work, making the assessment team. The first document review shall be carried out within 2 weeks.

Once the assessment team has processed the submitted "Recognition Request" as "valid", PAC shall make the assessment team by inviting 3 assessors no later than 3 weeks. For this work, PAC selects three assessors from the technical expert pool

- One Lead assessor
- Two Assessors

Chair and Vice-chair should provide the recommendation of 3 assessors to PAC members as well as the announcement of a new assessment within 1 week from the submission of the application by email or teleconference. No name of the applicant testing house shall be exposed in the announcement. If there is no objection from PAC members for the next 1 week, Chair and Vice-chair shall get a confirmation and send the official invitation to assessors. The lead assessor, takes a leading role of peer-assessment, shall come from the recognized testing house. The basic condition of the lead assessor is the experience of the conformance testing for more than 6 months as well as 2 actual testings.

If the invited assessors do NOT accept this invitation due to some reasons, PAC shall look for another assessor, but the consecutive rejection against the invitation from PAC is not allowed. Making assessment team shall be completed within 3 weeks from the application submission.

There is no strict rule for assessors' invitation, but Chair and Vice-chair should try to provide the even chance of the invitation in the assessors' pool. Additionally, the consecutive invitation of the same lead assessors on serial assessment should be avoided if there is no clear reason.

6.7.4. Step3 - Assessment Planning

In this step, the assessment team shall begin planning the assessment. Based on the "Testing House Assessment report" format in CharIN SVN folder (Annex A, SVN reference [A.3]), the assessment team creates the initial testing house assessment report including a detailed assessment plan such as:

- assessor names
- scope of application
- document review result from step 2
- assessment schedule including
    ✓ Technical review period by assessors
    ✓ One day online session for Q&A about technical review results and demo-testing
- expected expenses.

The assessment planning document shall be sent to chair and vice chair for a review no longer than 3 weeks after the acknowledgment of document review result. The completed assessment plan should be sent to chair and vice chair of PAC and, then it is reviewed by PAC with the way that chair or vice chair organize the teleconference to deal with it. The review process should be no longer than 2 weeks. If PAC makes comments or rejects the assessment plan by a clear reason, the result should be returned to the assessment team without delay, and the team shall revise it within 1 week.

If the plan is granted, the applicant shall acknowledge the assessment plan and perform the representative tests whose result is supposed to be submitted in the next step.

6.7.5. Step 4 - Submitting the sampled test results

If the assessment plan is granted, the assessment team shall announce it to testing house with the selection of at least two samples among the issued certificates. Testing house shall submit all testing materials as it has in archive according to its own QAP within 1 weeks, and it might include

- Test report document
- Comment and analysis sheet of test results (The format might be created by testing house.)
- Test report created by CCTS
- PCAP trace files,
- Measurement records, (e.g., timing measurements, voltage measurement, current measurement etc.)
- photo proofs,
- other proofs, if any required.

Same as the recognition of testing house process, and online assessment is the prioritized manner. But, if the assessment team concludes that the testing shall be witnessed on site, the lead assessor may notify the applicant that an on-site witness testing is required, and it shall be agreed by the PAC beforehand. (See step5).

6.7.6. Step 5 – Technical review and creation of assessment report

After receiving the result of the sampled tests, all assessors shall begin the review of it. This review is executed on remote in principle if there is no reason to witness and interview the testers at the moment. If there is the clear reason for on-site review raised by assessors, the assessment team shall forward the request to PAC. Upon the agreement by PAC, on-site review is feasible, and the cost planning should be following. All the cost shall be the part of the assessment plan later, but if the application rejects this on-site review plan, the assessment stops and is treated as "failed".

The assessment plan includes one day on-line assessment session to ask questions found during technical review and to execute the demo testing so that this session should be accommodated after technical review of each of assessor. For instance, after 3 weeks technical review, one day within the 4'th week could be selected based on the schedule agreement with assessors and testing house. While this on-line session, lead assessor shall confirm if quality system of the applicant is correctly declared by the submitted

document. Also, assessors can ask any questions based on found issues from technical review and pick the test cases that testing house shall execute. Demo testing and responses against questions asked by assessors will be one of the most critical factors on the result of technical accreditation. But if required, during the review process the assessor(s) may reach out directly to the applicant to resolve issue arising during the review process.

The technical review based on the submitted test results conducts for the selected test cases, and the lead assessor should make the first draft of test case selection list according to "assessment team according to "Testing house assessment test case selection reference sheet" in CharIN SVN folder (Annex A, SVN reference [A.4]) and share it with other assessors. Upon agreement, test case selection is confirmed.

The assessment team may request online witness, if deemed required without approval from PAC. Additionally, during the review process the assessor(s) may reach out directly to the applicant to resolve issue arising during the review process. From the technical review, each of assessors creates and submits technical review report with "Testing house assessment technical review report format" in CharIN SVN folder (Annex A, SVN reference [A.7]).

The assessment team shall conclude the non-conformities (if any) upon the agreement of all assessors. If there is inconsistent review result or non-conformities between assessors, the lead assessor shall analyze and resolve it. If the leas assessor is not able be resolve the matter, the lead assessor shall forward the matter to the chair or vice chair of PAC for resolving.

The non-conformities shall be recorded in the testing house assessment technical review report and assessment report. Non-conformities would be related to technical issues or procedural issues. The lead assessor shall communicate the non-conformities to the applicant and provide 1 month for the applicant to resolve and response to the non-conformities with the corrective actions. If the applicant

When all non-conformities have been cleared the assessment team shall complete the assessment report based on the initial report and submit it to the PAC with one of the three recommendations and additional comments, if applicable:

- No. 1 The Assessment Team recommends **acceptance** of the assessed organization as CharIN Testing House

- No. 2 The Assessment Team recommends **acceptance** of the assessed organization as CharIN Testing House **subject to clearance** of the outstanding non-Conformity till the next assessment
- No. 3 The Assessment Team recommends that the acceptance of the assessed organization is **postponed** until a further **assessment** is carried out and is found satisfactory

It shall remain possible for the testing house to become recognized if some of the non-conformities are not cleared but they are of minor nature or related to process elements. In this case the assessment team may refer to recommendation No.2.

The assessment team may conclude that the assessed organization does not meet the technical and procedural requirements, or the organization is not able to resolve and response to the non-conformities in the agreed time frame in that case the assessment team report shall recommend that the acceptance is postponed until a further assessment is carried out. Such a further assessment shall be carried out by a different assessment team (recommendation No. 3).

Throughout the technical review, the assessment team shall treat as "Critical issues" and then the assessment shall result into "the recommendation No. 3", when the below non-conformities are found:

- More than 3 incorrect verdicts of test cases
- Not calibrated CCTS
- Not calibrated measurement devices
- Not validated version of CCTS software and hardware
- Incorrect timing and measurement parameters for the testing
- More than 1 month for corrective actions of testing house against non-conformities
-

Other findings are reported as minor issues.

The technical review of the assessment team shall be completed no longer than 4 weeks after receiving the assessment package or receiving the corrective actions from testing house. Within this period, every assessor shall make the technical review result document based on Annex E with

- Overall review result

- Issue tracking: technical issues and corrective actions
- Comments and recommendation

When the technical review is finished, the review result document shall be shared in the assessment team, and the lead assessor shall announce the current assessment status to not only the chair and vice chair of PAC but also the testing house.

Based on the technical review result, the lead assessor shall create the assessment report. This report includes:

- Final verdict of the assessment; one of the above recommendations
- Executive summary of the assessment
- Summary of the granted assessment planning
- Consolidated technical review result of the assessment team
- The list of all submitted files from the testing house
- Procedure/Organizational comments, if any

The assessment report shall be submitted to chair and vice chair of PAC within 2 weeks after the technical review result from assessors are received.

6.7.7. Step 6 - Final Review and Renewal of Recognition

The PAC shall make the final review of the assessment report and its accompanying documents. The review of the assessment shall be fulfilled by PAC within 2 weeks from the submission of the assessment report, and the teleconference organized by chair or vice chair of PAC is basically applied. At the moment, the applicant's name can be exposed to all members of PAC and CharIN members. If there is not issue found from the assessment report and the verdict is positive, the PAC may refer the applicant to the ITCC. The ITCC extends the validity of the "Certificate of Recognition" for the next two years as CharIN test house for the relevant scope.

6.7.8. Dealing with Information

PAC shall be responsible for the management of all pieces of information obtained from the testing house or created during the bi-annual assessment process. All pieces of information (e. g. test reports) are to be considered confidential, except if published by the testing house itself, or if the testing house and PAC, assessors agreed otherwise. The assessment committee shall inform the testing house about the renewal of Recognition certificate. Afterwards the testing house can request it on the CharIN homepage.

7. Appeal

From the conformance testing, any complaints and disputes can be made, and QAP shall care them with "Board of Appeal". If there is no specific appointment, the chair and vice chair of PAC should take a role of the same positions in the Board of Appeal.

7.1. Board of Appeal

Board of Appeal shall take care of disputes related to the scheme. This procedure has been developed in order:

- To have a harmonized procedure for handling complaints

- To solve complaints in an appropriate time and manner

- To maintain the high reputation of the CharIN brand

- To ensure a fair competition between the testing laboratories

- To offer clear guidance for complainants in case they are not satisfied with the answer by the board of appeal

The Board of Appeal shall consist of a Chair and a Vice-Chair and appointed persons from members of recognized testing laboratories and members associated with CharIN and confirmed by ITCC. There shall be a maximum of ten (10) members in the Board of Appeal and a maximum of 1 member per organization, The terms of the members shall be limited to three years, however they may be reappointed for a further three years. Neither the Chair nor the Vice-Chair of the Board of Appeal, nor the members shall serve in a case in which their own testing laboratory or CharIN member is involved.

Decisions of the Board of Appeal about its recommendations shall be taken by a simple majority of the ten (10) members. The Chair is not a voting member. If the votes are equally divided, the Chair shall decide

upon the action to be taken. A case may be dealt with by correspondence, with the agreement of the parties involved.

The responsibilities of the Board of Appeal are:

- a) to recommend a solution to any dispute referred to it regarding the application of the CharIN rules, and
- b) to recommend actions to be taken against testing laboratories and members making use of the certification scheme regarding potential infringements to the CharIN rules that could compromise the credibility of the CharIN certification scheme.
- c) to report to all FG CT/IOP members, for appropriate action, any observations relating to the technical content of the standards accepted for use in the CharIN scheme and their applications, that has become evident when investigating a dispute.

7.2. General Process

Whether there is a complaint about a test, test report or test equipment that affects a testing laboratory, or the use of the CharIN certification mark that affects a license holder, or any other issue that affects a CharIN certified product, the complaint has to be addressed firstly directly to the party in question. If the concerned party gives an answer that does not satisfy the complainant, the complainant shall react within 1 month, then it may go on to the first escalation step and address the issue to the Chair of the board of appeal. The board of appeal shall either via correspondence, virtual or physical meeting discuss the matter and if needed institute a formal investigation. When carrying out the investigation, this is done by gathering sufficient reliable information to enable the issue to be properly addressed by proving or disproving matters relevant to the issue being investigated, considering all relevant information and no irrelevant information. When relevant information is obtained it shall be considered whether solution is now possible and further on the board of appeal shall agree on a solution. Next step shall be to prepare a document, which includes the complaint itself, how the investigation was conducted, relevant facts, conclusions, findings and recommendations. The recommendation shall be presented to the complainant and other party. If both parties agree the case shall deemed settled and both parties shall implement the proposed resolution. If one of the parties disagrees the chair of the board of appeal may bring the case to the attention of the ITCC.

8. Validation of CharIN Conformance Testing Systems (CCTS)

8.1. Target of validation

In order to achieve interoperability by the conformance testing, testers expect the consistent verdicts and interpretations from different CCTSs against at least the same SUT: EV or EVSE. From this expectation, the validation of CCTS is one of the most important activities in QAP.
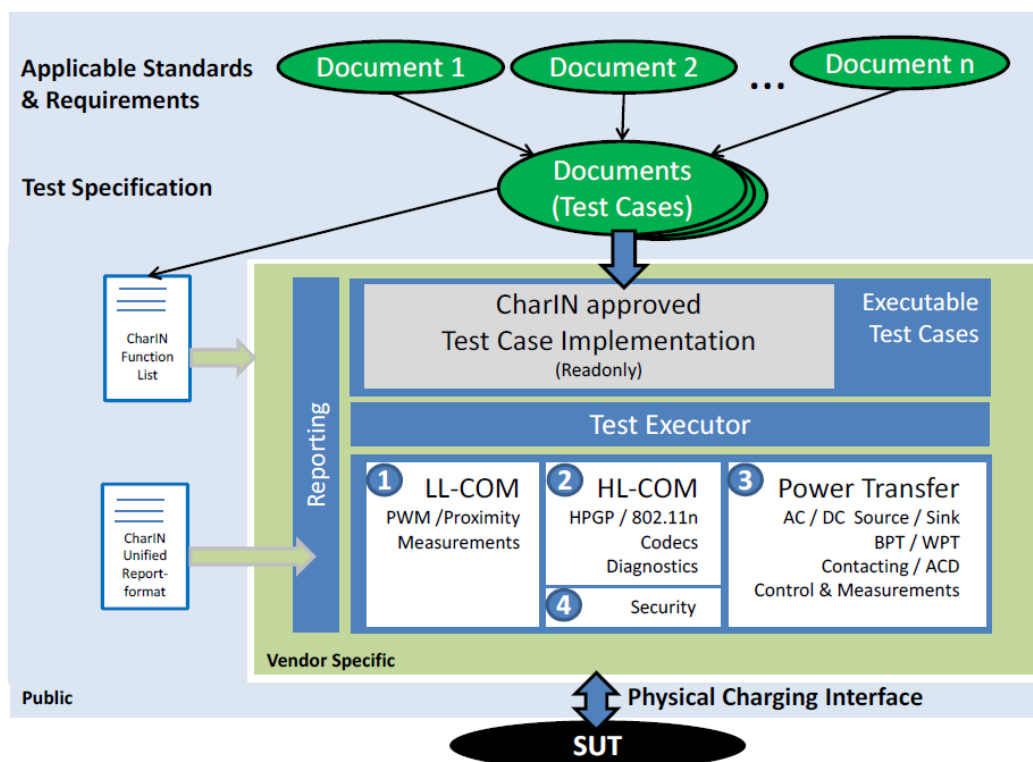

Figure 9. CCTS System architecture

Based on CCTS System architecture, designed by Vendor team, the target of validation is defined as CCTS with the combination of the below functionalities:

- LL-COM
- HL-COM
- Security
- Integration between COM and Power transfer including the control and measurement
- Output from CCTS, such as Report format, Measurement record, and Log

The below elements are NOT inclusive on the validation target:

- Enclosure of CCTS
- AC/DC Source/ Sink and relevant control Test case implementation
  - ✓ But, in order to prove the functionality, vendor shall implement the selected test cases for validation

Vendors shall execute another CharIN validation process when:

- Physical interface of COM is changed, i.e., from PLC to Wireless
- Integration interface or method between numbers 1-4 of Figure 9 (excluding the AC/DC Source/ Sink and relevant control of #3) is changed
- Implemented function(s) or rating (according to latest CCTS Specification) is revised, i.e., the range of measurement function such as voltage, current, frequency, phase and so on
- Major hardware or software revision

Any other change shall be validated by the vendor itself to make sure the validated results remain. Documentation of the internal validation must be provided on request.

8.1.1. Model type of CCTS validation

CCTS validation does NOT apply certifying scheme BUT the technical validation method of functionalities and capabilities, which are implemented in CCTS. To make target of CCTS validation clearer, the following definitions are given:

- CCTS solution: the combined system or architecture of hardware and software to process the functionalities and capabilities described in CCTS specification
- Representative CCTS model type: the representative product made by the essential implementation package of CCTS solution
- CCTS product: all deviated products based on the representative CCTS model type if and only if there is no change of the defined functionalities in 8.1

CCTS validation is targeting CCTS solution, but since it might not be validated with black box testing approach, the actual validation process is carried out with the given representative model type by vendor, i.e., posting the result of successful CCTS validation on CharIN homepage. Upon the request of vendor, CCTS solution name can be also exposed with the name of representative CCTS model type.

Based on one representative CCTS type model (CCTS solution), CCTS vendor can make series of CCTS products to cover a particular application (portable, EMC, ...) or to couple with various power modules/ratings. Then the qualities of them shall be assured by CCTS vendors. In this case, the quality means that CCTS products are implemented with the same level of functionalities and capabilities.

8.2. Pre-condition of CCTS validation

8.2.1. Test Case implementation categories for self-declaration of CCTS vendor

Test cases, themselves, are not the part of CCTS validation, but all CCTSs must show their functionalities and capabilities through test case implementation. As a pre-condition of CCTS validation, vendors shall declare their implementation status with three categories as follows by themselves and the declaration is checked by the actual validation process:

- Implemented: The status that the implementation of test case into CCTS of the specific vendor is completed.

- Executable: All the descriptions in test case are in the range of CCTS capabilities and functionalities so that vendor can execute the implemented test case into CCTS. Then, this test case is categorized to "executable".

- Verified by vendor self-declaration: After the execution of the implemented test case with CCTS, if the engineer of vendor reviewed the test result and gave the final confirmation as "OK" or "No error", the test case can be declared as "Verified".

8.2.2. Test Case selection for CCTS validation

Within the given functionalities and capabilities, CCTS validation shall prove the quality over all relevant test cases for the conformance testing. Therefore, CCTS validation shall be committed for the subset of "mandatory" test cases as specified in the umbrella document for a given target in the CCS step model (technical scope). As a precondition, candidate vendor(s) must declare the implementation status as "Verified by vendor self-declaration" for the subset of mandatory test cases. Other subsets of test cases than defined in the umbrella document are not allowed for CCTS validation.

8.2.3. Criteria for CCTS validation

Candidate vendors shall satisfy the below requirements before applying their testing systems as CCTS:

- Be a member of the CharIN association

- Shall be a member of Vendor Team in Focus Group Conformance testing/Interoperability (FG CT&IOP)

- Shall have listed at least one technical experts in "human resource pool" actively and regularly participating in Vendor Team of FG CT&IOP after CCTS vendor application submitted

- Shall give at least one contribution point (each of participating or taking a role, supporting can count one point.), such as

  - Participating CCTS testing event or CCTS validation, testing house assessment as "Witness" or "assessor(reviewer)"

  - Co-work or taking a role of QAP development

  - Supporting the events organized by CharIN Focus Group Conformance test / IOP

- Shall put down the declaration document that the functions and specifications of their CCTS are compliant to the "Function List" as well as "Electrical Specification" in "CharIN function set CCTS" document[6]

- Shall provide the declaration document that the whole test cases are defined as "implemented", "Executable", "Verified by vendor self-declaration"

- Shall declare the implementation status for the whole mandatory test cases specified in the umbrella document for a given target in the CCS step model as "Verified by vendor self-declaration"

- Shall provide the proofs for PLC chip and board conformity with PLC chipset information, firmware version, and self-verification of board according to DIN Spec 70121, Table 10 and ISO 15118-3, Table A.11

8.3. Validation procedure

8.3.1. Exception – event based validation

Regarding the initial CCTS validation about new CCS specification or technical scope, PAC is not able to apply the below process because there is no recognized testing house. Note that the criteria for testing house is to own the validated CCTS. At the moment, PAC can organize "event-based validation" for CCTS candidates when the number of candidate vendors are at least 2.

In this validation, PAC should include the role of the recognized testing house such as

- Criteria and the submitted document review

- Make testing plan

- Test material handling

- All required activities for event

If SUTs (EV/EVSE/simulators) can be provided, there is no limitation for the event organization, for instance,

- On site face-to-face event (cooperation with CharIN coordination office)

- Remote testing event

One of the most important conditions for this event is that all candidate CCTSs shall execute test cases against the consistently implemented SUT(s) and the number of the reviewers shall be at least 2. The final decision of the validation event shall be made by following "Step 4" of the regular CCTS validation.

While this initial CCTS validation, the review process should be fulfilled very carefully. Based on the experience of CharIN QAP, test cases, specification, and all related technical documents are not completed so that some of inconsistent verdicts between CCTS candidates can come from the issues of technical documentations.

In the case of the initial CCTS validation event, in principle, all activities are assumed as "voluntary", but if some expenses are required, CharIN coordination office or PAC can claim to candidate CCTS vendors as beneficiary.
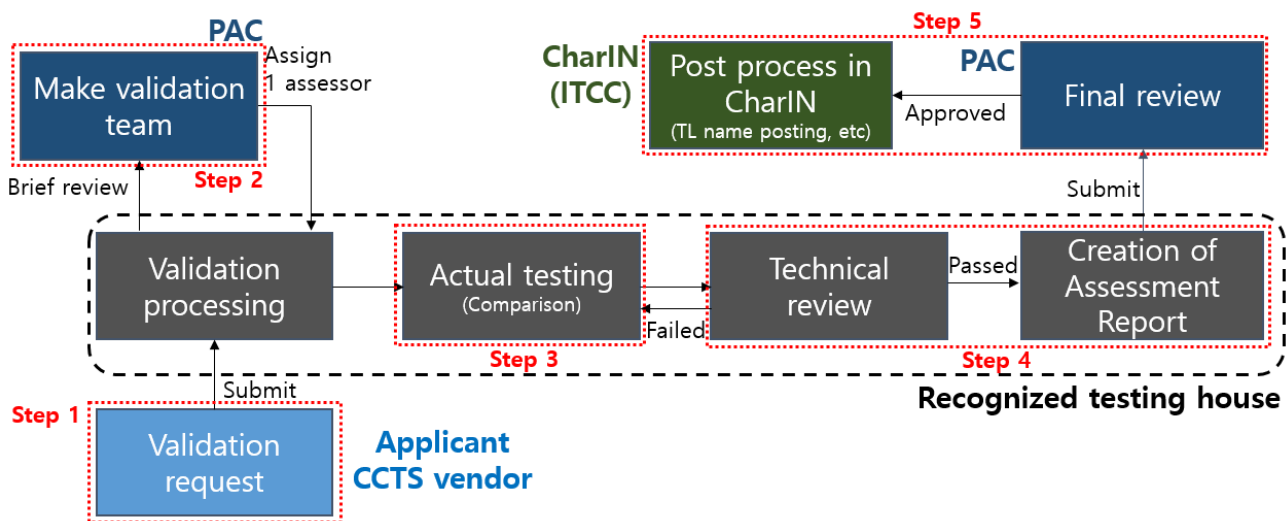
8.3.2. Overview

Figure 10. Flow chart of CCTS validation process

Step	Work	Work detail	Related entity	Process time
1	Submit application for validation	Application form	Applicant CCTS vendor	-
		Brief review	Recognized testing house	1 week
2	Make validation team	Organize validation team	PAC	2 weeks
3	Validation testing	Actual testing	Recognized testing house	4 weeks
4	Technical review and creation of report	Technical review and creation of validation report	Recognized testing house	2 weeks
		Review the report	Validation team	2 weeks
5	Final Review and validation complete	Final review	PAC	2 weeks
		Accept	ITCC	-
	The whole process			Less than 13 weeks if there is

				no procedural issues

8.3.3. Step 1 – Submitting Application for validation to the recognized testing house

CCTS vendor shall fill in "CCTS validation application" form of CharIN SVN folder (Annex A, SVN reference [A.8]) to the recognized testing house while indicating if the application is for the validation. According to the vendor's preference, the recognized testing house can be chosen by the applicant CCTS vendor, but the testing house shall be:

- NOT related to the development or improvement of CCTS to be tested
- able to carry out test cases of the validation scope (CCS specification) by using at least 1 other validated CCTS for the comparison
- able to bring EV/EVSE or the simulator as SUT against CCTS (EV or EVSE could be brought by CCTS vendor, if required)

The filled application shall include the following information:

- Representative name of CCTS solution
- Manual of CCTS to be validated
- PLC chip and board information, such as chipset information, firmware
- Safety warnings of CCTS
- Circuit diagram of CCTS to be validated
- Integration information between COMM and power module, such as communication connection
- Declaration documents for "Function list", "Electrical Specification", test case "implemented"/"Executable"/"Verified by vendor self-declaration" sheet, Verification report of PLC chip board.

After a brief verification of the filled-in contents on the application form, the recognized testing house shall forward the application to Chair and Vice-chair of PAC no longer than 1 week from the submission of the application.

8.3.4. Step 2 – Making validation team

Upon receiving the application from the testing house, Chair and Vice-chair of PAC shall check if the testing house is NOT related to CCTS. If the checking is completed, PAC shall make the validation team by inviting 1 expert within 1 week. With one expert from the chosen testing house by the applicant CCTS vendor, the validation team is composed of 2 experts. Another expert shall be invited from the validation CCTS vendor as the manner of "Peer-assessment". Chair and Vice-chair should try to provide the even chance of the invitation in the human resource pool.

If there is no objection from PAC members within 1 week, Chair and Vice-chair shall get a confirmation and send the official invitation to another expert. The expert of the testing house takes a leading role of the whole validation process such as the announcement to application about

- Expected expenses (Testing cost is dependent on the testing house, but the expense for invitation of expert should be estimated from "11.3 Payment for Expert Invitation")
- Validation schedule

8.3.5. Step 3 – Validation testing

According to 8.2.2, validation test shall be performed for the whole mandatory test cases given by the umbrella document of the target step model.

The validation testing shall be carried out on the same way of the conformance testing, by the operation of applicant CCTS vendor on vendor spot (remote testing) or in the recognized testing house, which the application was submitted to. Test cases shall be executed two times by using:

- The validated CCTS in testing house
- CCTS; to be validated and provided by applicant

Basically, the real EV and EVSE are used as SUT. A simulator, which behaves like EV or EVSE, can be also introduced instead of the real EV and EVSE. In order to check the capabilities and functionalities of CCTS, testing house shall configure the test environment (SUT), so that at least 10% of test cases (distributed across all validated standards) result in "failed" verdict assuming a valid CCTS.All "passed" results against SUT are not acceptable as the validation test.

After completing the conformance tests, vendor shall deliver SUT and the test results, such as Test report files created by CCTS, PCAP trace file, measurement records, photo proofs, to Testing house. Then, testing house shall execute the same test cases against the provided SUT compare the test results between the

validated CCTS and the applicant CCTS. Upon the analysis, tester shall check whether all the verdicts and proofs of testing are consistent.

The actual testing shall be completed within 4 weeks after the announcement from PAC.

8.3.6. Step 4 – Technical review and creation of report

If the actual testing is completed, the testing house shall review the test results and create the first validation report by using "CCTS validation report format for reviewer" in CharIN SVN folder (Annex A, SVN reference [A.10]). It shall be fulfilled no longer than 1 week after finishing the actual testing.

The whole materials for validation shall be delivered or posted to the designated archive by CharIN for another invited expert, and they are defined as the validation package, which is composed of:

- All submitted documents by vendor
- Validation report document
- Test report from CCTS
- PCAP trace files, if necessary, with master secret file (txt file)
- Measurement record screen shots, (e.g., timing measurements, voltage measurement, current measurement etc.)
- other proofs, if any required

The validation expert shall review the validation package. If there is something to need to be improved about the validation testing, the expert shall make the comments on the validation report, and then the testing house shall be responsible to resolve the comments. The single review by the validation expert and the resolution by testing house shall be accordingly completed within 2 weeks. When all comments are cleared, the final decision of the report shall be effective.

If any inconsistent test result by comparing the results from the validated CCTS is found and it can be proven by testing materials, the validation shall be treated as "Failed". In other words, when the verdicts of all executed test cases from the applicant CCTS as well as the validated CCTS are consistent, the final decision of the validation can be "Passed".

If the whole review process is completed, the testing house shall forward the validation report to Chair and Vice-chair of PAC.

8.3.7. Step 5 – Final review and validation complete

The PAC shall make the final review of the validation report. The review shall be fulfilled by PAC within 2 weeks from the submission of the validation report, and the teleconference organized by chair or vice chair of PAC is basically applied. At the moment, the applicant's name can be exposed to all members of PAC. If there is not issue found from the validation report and the verdict is positive, PAC may refer the applicant to ITCC. ITCC may announce CCTS name and details as the validated CCTS.

8.3.8. Dealing with Information

PAC shall be responsible for the management of all pieces of information obtained from the testing house or created during the validation process. All pieces of information (e. g. test reports) are to be considered confidential, except if published by the testing house itself as well as CCTS vendor, or if the testing house and PAC, assessors agreed otherwise.

ITCC shall inform CCTS vendor about the validation announcement to the public. Afterwards the CCTS vendor can request it on the CharIN homepage.

.

9. Feedback Handling

9.1. Prerequisites

For handling complaints there shall be chairmen boards for all testing houses, certification bodies and CharIN. In addition to chapter 5.5.1. there shall also be a chairmen board for all testing houses, handling any complaints regarding a testing house. For this, there shall be an individual testing house chairmen board for each complaint regarding a testing house, that will be announced individually for every complaint. To this end, each testing house shall announce one person, who can be announced to the testing house's chairmen board. For each complaint that is directed to a testing house, a chairmen board with at least 5 selected members of different testing houses shall be announced. For this, CharIN shall announce one person, who is fully independent, to be the contact person for receiving complaints regarding the testing houses. If the number of recognized testing house is less than 5 or there is the recommendation from FG CT/IOP, PAC can take over the role of chairmen board.

After receiving the complaint, the announced person shall announce the chairmen of different testing houses to the testing house's chairmen board for further investigation. The announced chairmen of each testing house shall not be involved in the complaints. The members of the testing house's chairmen board must be independent to the accused body. The issues of the complaint and what kind of resolution the complaint is seeking shall be clarified. If it is not a matter that can be handled by the testing house, the testing house's chairmen board shall make a short judgement about the complaint with a referral to another chairmen board (e.g., assessment committee's chairmen board or CharIN chairmen board).

9.2. Feedback Handling Process

When it is clear which chairmen board is processing the complaint, the first approach is to find an appropriate and possible seek to achieve a solution. When a solution is reached, the agreed action shall be documented. In this event it may not be necessary to continue with the investigation unless there are systemic issues that require further examination. If the complaint is not resolved, determine what action is required, which may include options other than a formal investigation. This can depend on factors such as statutory requirements which may apply, the nature of the issue and the likely outcome of the investigation.

Where possible, complaints should be resolved without the need for a formal investigation. If investigating, there shall be a definition of the issues to be investigated and an investigation plan shall be developed. When carrying out the investigation, this is done by gathering sufficient reliable information to enable the issue to be properly addressed by proving or disproving matters relevant to the issue being investigated, considering all relevant information and no irrelevant information. When relevant information is obtained it shall be considered whether solution is now possible and further on the chairmen board shall agree on a solution. Next step shall be to prepare a document, which includes the complaint itself, how the investigation was conducted, relevant facts, conclusions, findings and recommendations. Recommendations could include remedies for the complaining body, action to improve the accused body's services. The processing chairmen board shall decide about the complaint and the action to be taken. After the decision is made arrange implementation of the agreed action. Upon completion of the investigation, the complainant (and, if applicable, the person who is the s of the complaint) shall be given an adequate reason for any decision made and information of the changes or action that have resulted from the complaint. The complaint shall be processed in an appropriate given time.

10. Validity of Test Certificate

10.1. Consideration

CharIN conformance testing QAP process for interoperability applies certification scheme Type 1a of ISO/IEC 17067 standard so that there are no additional activities except the actual conformance testing. It means that the proving and responsibility of the identical implementation into the real product are on the applicant; OEMs and manufactures.

However, the relevant identification information to interoperability and implementation shall be exposed on the first page of test certificates for the sake of customer protection. Therefore, if any implementation and parts, elements, components of the product, which are related to the conformance testing, are updated or changed, replaced, OEM or manufacturers shall revise the identifications of it.

10.2. Validity of Test Certificate

Test certificate shall be valid as long as all exposed information on it is identical to the product. Otherwise, the test certificate shall be obsoleted and no valid in the market.

The exposed identification information is:

- Major hardware version
- Connector type
- Major firmware version
- Major software version
- QCA version
- Power class
- Input rating
- Major ECU firmware version
- Major EVSE controller version

11. Technical Expert Pool

11.1. Technical Experts

The purpose of technical experts is to provide focused technical expertise with regards to the CharIN conformity assessment program. CharIN shall maintain a list of technical experts nominated by CharIN members. CharIN shall ensure that there is a balanced member distribution and a balanced field of expertise represented in the pool of technical experts.

Technical experts may support, but not limited, with the following tasks:

- Peer-assessment as reviewers and assessors

- Considering technical inquiries pertaining to CharIN testing requirements and testing against CharIN requirements

- Creating technical decisions sheets relevant for testing

- Considering technical inquiries pertaining all standards relevant for CharIN

- Technical advisory role for proficiency testing programs if such program is required

- Developing testing guidelines

11.2. Minimal Qualification Requirements

Members of the technical expert pool shall have particular expertise in one or more of the following standards:

- IEC 61851 series

- DIN SPEC 70121 / 70122

- ISO 15118 series

- ISO 17409

- ISO 17025

- All CharIN technical guide and specification, test case documents

In order to register expert into expert pool, expert shall show enough experience and knowledge to cover the above activities by submitting filled in "Application form CharIN Technical Expert" of CharIN SVN folder (Annex A, SVN reference [11]) including at least one of bellows:

- Standardization group activities for at least 1 year continuously
- Standardization group work contributions; leader, editing document, new proposal, commenting
- CharIN activities for at least 1 year continuously
- CharIN work contributions; leader, editing document, new proposal, commenting
- Recommendation from the registered experts

Based on the submitted application form, PAC or QT will review it and decide of expert registration.

11.3. Payment for expert invitation

Against the assigned work for each of invited experts, the applicant of testing houses assessment or CCTS validation shall take the payment to experts. The details are as follows:

Category	Details	Payment and expected lead time
Basic	Common	1 000 EUROs per day
Testing house assessment	Lead assessor	8 days
	Assessor	5 days
CCTS validation	Assessor	10 days

The company, which the invited expert is working for, or the expert personal shall issue the invoice with the calculated fee based on the above table to applicant, and the applicant shall transfer the fee and check the confirmation.

11.4. Training and Qualification Program

CharIN can organize appropriate training for the technical experts which may support them in fulfilling their tasks as technical experts. Training can be arranged for all technical experts who work as peer assessor.

11.5. Confidentiality and Integrity

Technical experts shall commit to the confidentiality and integrity by signing the technical expert application form. With this, every expert shall follow the policy of the confidentiality and integrity on all activities of CharIN

12. Annex A. SVN reference folder of QAP templates and forms

[A.1] Testing house assessment application form:

https://svn.charinev.org/FG_interoperability/repos/02_Activities/SG_Qualification/Quality_Assurance _Plan/Template and Application form/Testing house assessment/Application form

[A.2] Review result template of the submitted application:

https://svn.charinev.org/FG_interoperability/repos/02_Activities/SG_Qualification/Quality_Assurance _Plan/Template and Application form/Testing house assessment/Review result of the submitted application

[A.3] Testing house assessment report:

https://svn.charinev.org/FG_interoperability/repos/02_Activities/SG_Qualification/Quality_Assurance _Plan/Template and Application form/Testing house assessment/Assessment report

[A.4] Testing house assessment test case selection reference sheet:

https://svn.charinev.org/FG_interoperability/repos/02_Activities/SG_Qualification/Quality_Assurance _Plan/Template and Application form/Testing house assessment/Testing house assessment test case selection format

[A.5] Test report template (xlsx file):

https://svn.charinev.org/FG_interoperability/repos/02_Activities/SG_Qualification/Quality_Assurance _Plan/Template and Application form/Test report and certificate

[A.6] Test case result template:

https://svn.charinev.org/FG_interoperability/repos/02_Activities/SG_Qualification/Quality_Assurance _Plan/Template and Application form/Testing house assessment/Format for testing house

[A.7] Testing house assessment technical review report format:

https://svn.charinev.org/FG_interoperability/repos/02_Activities/SG_Qualification/Quality_Assurance _Plan/Template and Application form/Testing house assessment/Format for assessor

[A.8] CCTS validation application form:

https://svn.charinev.org/FG_interoperability/repos/02_Activities/SG_Qualification/Quality_Assurance _Plan/Template and Application form/CCTS validation/Application form

[A.9] CCTS validation report format:

https://svn.charinev.org/FG_interoperability/repos/02_Activities/SG_Qualification/Quality_Assurance _Plan/Template and Application form/CCTS validation/Format for vendor

[A.10] CCTS Validation review report format:

https://svn.charinev.org/FG_interoperability/repos/02_Activities/SG_Qualification/Quality_Assurance _Plan/Template and Application form/Testing house assessment/Format for assessor

[A.11] Application Form CharIN Technical Expert:

https://svn.charinev.org/FG_interoperability/repos/02_Activities/SG_Qualification/Quality_Assurance _Plan/Template and Application form/Expert registration

[A.12] Certificate template:

https://svn.charinev.org/FG_interoperability/repos/02_Activities/SG_Qualification/Quality_Assurance _Plan/Template and Application form/Test report and certificate

[A.13] NDA agreement form: need to be added