



Empowering
the next level
of e-mobility

CharIN – Charging Interface Initiative e. V.

31st GC ESC meeting

Julian Treichel (Porsche) - 28th September 2023, Ljubljana



Differentiation between DC charging and V2G vs. AC charging and V2G

Main points of discussion within CharIN network code commenting group

NC DC and NC RfG proposals state requirements for AC and DC charging and V2G, which are currently not covered by national or international standards nor by EV homologation.

To ensure an interoperable and NC DC/RfG compliant products, a transition period is needed.

Since any EV can be connected to any EVSE, interoperability must be given while the whole system out of EV and EVSE has to fulfill the requirements.

DC V1G and DC V2G

- DC V2G is considered as an Energy Storage Module, the separate requirements in the proposal for EV and EVSE are appreciated

AC V1G and AC V2G

- Because of the mobile power electronics in the EV, the requirements drafted in NC DC and RfG are not achievable for AC V1G and are difficult to fulfill for AC V2G
- Taking into account the technical possibilities and constraints for AC V1G and V2G, different solutions (see following slides) are possible and shall not be limited by regulation
- Configuration of grid code parameters take place via a stationary and permanently-connected EVSE, which ensures the grid code compliance at the point of connection

AC V2G Approaches (NC RfG)

What all solutions have in common and about the final target

Target: Compliance with requirements for generators proved via **certification of on-board-charger** according to **EN 50549-10** and referenced via **vehicle homologation** accepting (dis)charging-system certification according to EN 50549-10.



ISO 15118-20 Edition X



EVSE:

- Certification of data exchange protocol (ISO 15118-20)
- Setting and storage of grid code parameters and transfer via ISO 15118-20
- FRT immunity

EV:

- Reaction on grid disturbances (rapid voltage changes, flicker, harmonics and inter-harmonics)
- Grid-synchronization & grid-(re-)connection
- Active and reactive power control (e.g. $\cos(\phi)$, $Q(U)$)
- Dynamic grid support (HVRT & LVRT)

Different approaches for location of interface protection, anti-islanding-detection and certification follow

EV focussed certification approach

Possible solution with a certified EV

Certification of EVSE according to ISO 15118-20

Certification of EV according to grid code(s)



EVSE:

- Certification of data exchange protocol (ISO 15118-20)
- Setting and storage of grid code parameters and transfer via ISO 15118-20
- FRT immunity
- **Certification check**

EV:

- Reaction on grid disturbances (rapid voltage changes, flicker, harmonics and inter-harmonics)
- Grid-synchronization & grid-(re-)connection
- Active and reactive power control (e.g. $\cos(\phi)$, $Q(U)$)
- Dynamic grid support (HVRT & LVRT)
- **Interface protection (incl. grid-synchronization)**
- **Anti-islanding detection**

Digital certificates are one option, easier options such as „certified“ strings, vehicle ID or manual approval needed

EVSE focussed certification approach

Another possible solution with EVSE as gatekeeper and monitoring device

Country/region specific certification of EVSE as:

- Interface protection device
- “supervisor” of the generating set (EV) incl. AC-Bidi-EVSE specific functions



ISO 15118-20 Edition X

NO country/region specific certification



EVSE:

Certification according to existing requirements:

- **interface protection (incl. grid-synchronization + storage of grid faults)**
- **anti-islanding detection**

Certification of supervisory functions:

- grid-connection
- dynamic grid support
- active and reactive power control

Certification of AC-Bidi-EVSE-specific functions:

- storage & communication of grid code parameters to EV

EV:

- Reaction on grid disturbances (rapid voltage changes, flicker, harmonics and inter-harmonics)
- Grid-synchronization & grid-(re-)connection
- Active and reactive power control (e.g. $\cos(\phi)$, $Q(U)$)
- Dynamic grid support (HVRT & LVRT)

Monitoring of EV by EVSE and certification of EVSE only should be a sufficient option

Excerpt of comments on ACER proposal for NC DC (V1G)

NC DC brings huge challenges for state of the art AC charging



Article	Draft text	Remark
XX+2/ XX+3	V1G electric vehicles and associated V1G electric vehicle supply equipment, power-to-gas demand units and heat-pumps shall possess equipment certificates, proving compliance with this regulation.	EVs move around Europe, so a central certification (or even better homologation) according to a central European standard like EN 50549-10 is required.
XXX.3(i)	The response time for LFSM-UC shall be less or equal to 0,5 seconds . The relevant system operator has the right to request the demonstration of technical evidence of the response time.	AC charging: If frequency measurement by EVSE → Up to 10 seconds needed and only maximum power limits. If frequency measurement by EV → There is currently no way to transfer frequency threshold or droop data to EV.
3.1 (e)	new V1G electric vehicles that do not meet the definition of electricity storage and associated V1G electric vehicle supply equipment[...], with maximum consumption capacity larger than 800W at any voltage level. The relevant system operator shall refuse to allow the connection of a new transmission-connected demand facility, a new transmission-connected distribution facility, or a new distribution system, a new V1G electric vehicles and associated V1G electric vehicle supply equipment [...], which does not comply with the requirements set out in this Regulation and which is not covered by a derogation granted by the regulatory authority, or other authority where applicable in a Member State pursuant to Article 50.	Definition of " new " is unclear, what is meant by "new"? There must be a long enough transition period to guarantee the revision of these standards! Question: " associated " = " connected "? Interoperability between different EVSEs and EVs must be given! Make clear that only stationary and permanently connected EVSE are meant in NC DC and NC RfG!
25.3(c)	An update of the applicable technical data, simulation models and studies proving compliance of electric vehicles and associated V1G electric vehicle supply equipment , power-to-gas demand units and heat-pumps.	AC charging: Simulation models not possible for moving EVs.
XX 2. (d)	The V1G electric vehicle and associated V1G electric vehicle supply equipment, power-to-gas demand unit and heat-pump shall be capable of remaining connected to the network and continuing to operate stably when the system frequency remains within the frequency range specified in Table 2 . The V1G electric vehicle and associated V1G electric vehicle supply equipment, power-to-gas demand unit and heat-pump protection schemes shall not jeopardise frequency-ride-through performance specified in point 2.b from this Article;	Example editorial error (there is no Table 2) → Frequency ranges must be clear so that manufacturers can check whether PLC communication between EVSE and EV is also supported at low frequency levels

General question: How to test compliance for EV and associated EVSE?

Excerpt of comments on ACER proposal for NC RfG (V2G)

Additional remarks on NC RfG regarding V2G



Article	Draft text	Remarks
13a 6a	A type EV1 and EV2 V2G electric vehicle and associated V2G electric vehicle supply equipment which is consuming active power during an overfrequency event shall increase the level of active power consumed according to the LFSM-O characteristic, to the extent that is technically feasible . The type EV1 and EV2 V2G electric vehicle and associated V2G electric vehicle supply equipment shall consume power up to filling the maximum energy that it is able to store, then it may cease consumption.	Do only V2G electric vehicles and associated V2G electric vehicle supply equipment have to fulfill these requirements? What about V1G electric vehicles and associated electric vehicle supply equipment? Are these requirements in RfG due to V2G electric vehicle and V2G electric vehicle supply equipment being an energy storage module? Proposal: Shift these requirements to NC DC , if also relevant for V1G. If not, delete it. Question: What about local overload protection ?
14a	Requirements for type EV3 electric vehicles and associated V2G electric vehicle supply equipment and V2G electrical charging parks	One EV2 EV+EVSE builds a V2G electrical charging park per definition. However, article 14a cannot be applicable for a single EV2 EV+EVSE!
5.6	V2G electric vehicles and associated V2G electric vehicle supply equipment, within the following categories shall be considered as significant: (a) maximum capacity larger than or equal to 0,8 kW and less than 2,4 kW (type EV1); (b) maximum capacity larger than or equal to 2,4 kW and less than or equal to 42 kW (type EV2); (c) maximum capacity larger than 42 kW and less than 1 MW (type EV3).	Align with CharIN BiDi Power Classes: EV2 should include 50 kW! What if the EVSE has two charging points , both are capable of 40kW active power output to the grid. What is the maximum capacity? 40kW or 80kW? Please clarify. Assumption: 40kW → EV2. How is "maximum capacity" defined? The logic must be that the EVSE maximum active power output capacity is relevant here. EVs change, if minimum between EV and EVSE is taken, this value would always change.
42.5	Concerning V2G electric vehicle and V2G electric vehicle supply equipment, compliance shall be based on individual type-test certificates issued as per Regulation (EC) No 765/2008 regarding the V2G electric vehicle supply equipment on one side and the V2G electric vehicle homologated platform on the other side. A certification shall include for instance the data exchange protocol , or system performance criteria , associating the V2G electric vehicle supply equipment and the V2G electric vehicle homologated platform.	" Type-test certificates ": Are these similar to equipment certificates? " V2G electric vehicle homologated platform ": Here, an in-vehicle charging system, which can be used in different electric vehicle platforms, is meant? " Data exchange protocol ": The communication protocol between EVSE and EV like ISO 15118 is meant, and not the communication protocol between EVSE and system operator? " System performance criteria ": Please define this term. " Associating ": Interoperability between different EVSEs and EVs is still given?
2. (67)	A V2G electric vehicle and associated V2G electric vehicle supply equipment with a bidirectional functionality is regarded as an electricity storage module ;	Make clear that V2G EVs and EVSE don't have to fulfill the requirements for electricity storage modules, but have separate requirements .

Next steps

What about a workshop?

We would like to discuss our concerns and concepts with you!

Who wants to join our workshop in October (exact date tbd)?

Proposed agenda:

ID	Topic	Start	Duration
1	Welcome & Introduction	09:00 AM	00:05
2	Short overview about stakeholders and current status	09:05 AM	00:35
3	Regulatory view Q+A	09:40 AM	00:40
4	TSO and DSO view Q+A	10:20 AM	00:40
5	OEM and Standardization	11:00 AM	00:20
6	Business opportunities	11:20 AM	00:20
7	Real projects of BiDi charging	11:40 AM	00:20
	End	12:00 AM	

Thank you for your kind attention!

Any questions?

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