Grid Integration Levels

There are many levels of Grid Integration that can generate value
CCS with ISO/ISO 15118-20 is the key enabler of Grid Integration and is ready for V2G
This technology is prepared for a wide range of use cases.

<table>
<thead>
<tr>
<th>Description</th>
<th>Level 1 - V1G Controlled Charging</th>
<th>Level 2 - V1G/H Cooperative Charging</th>
<th>Level 3 – V2H Bidirectional Charging</th>
<th>Level 4 – V2G Aggregated (bidirectional) charging</th>
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</thead>
<tbody>
<tr>
<td>• EV and EVSE are compliant with the local requirements, guidelines and regulations. • This level only considers charging events from grid to EV. • The charging power is below thresholds, requiring controllability / load management by the DSO.</td>
<td>• The charging event can be influenced regarding the charging power and can be shifted in time remotely by DSO (with highest priority), CPO, EV user, EV or home energy management (HEM). • The EV is capable to wake up for defined start/stops. • Reaction timings are defined. • EV/EVSE, HEM consider variable power settings.</td>
<td>• Energy transfers between EVs battery and the home / customer system. • Energy transfers are motivated by sustainability or economical reasons (storage and usage of power, generated by local PV panels or similar). • Supports behind the meter (BTM) use cases</td>
<td>• The EV and the EVSE fulfill functions that go beyond the customer’s own energy system (bidirectional energy transfers, aggregators qualification, full balancing market services, economic interests of the EV owner). • Supports in front of the meter (FTM) use cases • Swarm qualification/aggregation across larger area (entire state or country)</td>
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</tbody>
</table>

Technical requirements:

- Various local regulations per country (e.g. grid codes, IEC61851-1, IEC 60364 series, …)
- Local regulations EV and EVSE
  - PWM signal, IEC 61851
  - DIN SPEC 70121 (for DC)
  - EVSE and grid (Utility, CPO, …)
  - OCPP 1.6
  - Demand-response
  - Opt-out possibilities
- Local regulations EV and EVSE
  - ISO/IEC15118 Ed1
  - Telematics
  - EVSE and grid
  - OCPP 1.6
  - See level 1
  - ToU
- Local regulations EV and EVSE
  - See level 2
  - ISO/IEC15118-20
  - EVSE and grid
  - See level 2
  - EEBus
  - Many requirements still missing
- Local regulations EV and EVSE
  - See level 2
  - EVSE and grid
  - See level 3
  - Many requirements still missing

Grid connection

Grid integration

EV – electric vehicle, EVSE – electric vehicle supply equipment, DSO – distributed system operator, CPO – charge point operator