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<tr>
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<th>17-IEPR-07</th>
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<tr>
<td><strong>Project Title:</strong></td>
<td>Integrated Resource Planning</td>
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<tr>
<td><strong>Document Title:</strong></td>
<td>Presentation - The Path to a Global Charging Standard</td>
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<tr>
<td><strong>Description:</strong></td>
<td>Presentation from Charin regarding the benefits of electric vehicle charging stations.</td>
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<tr>
<td><strong>Filer:</strong></td>
<td>Tami Haas</td>
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<td>Charin</td>
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CharIn e.V.
The path to a global charging standard
World Map of Charging System Standards

CCS
CHAdeMO
GBT
Not decided
Overview of Charging Systems

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<tr>
<th></th>
<th>Europe CCS (AC &amp; DC)</th>
<th>USA CCS (AC &amp; DC)</th>
<th>Japan CCS (AC)/CHAdeMO (DC)</th>
<th>China GB</th>
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<tbody>
<tr>
<td>AC</td>
<td>Type 2</td>
<td>Type 1</td>
<td>Type 1</td>
<td>GB</td>
</tr>
<tr>
<td>DC</td>
<td>Combo 2</td>
<td>Combo 1</td>
<td>CHAdeMO</td>
<td>GB</td>
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Differences in standards

- Geometry of vehicle connectors and vehicle inlets
- Single System approach vs. separated systems for AC and DC
- Communication protocol between vehicle and charging station
- Electrical characteristics (P, V, I)
- System Architecture
- Overall system costs
Detailed overview of CCS
Combined Charging System

- Integrated electrical architecture for all relevant AC and DC charging scenarios
- One inlet and one charging architecture for DC and AC
  ➔ low overall system costs
- Electrical lock mechanism in vehicle inlet
- PLC communication
- 100% SOC in one charging process possible - Charging supervision can handle energy peaks (Smart Grid) w. demand / response mechanisms
- Maximal charging power up to 350 kW (today 200 kW)
- Charging voltage up to 1.000 V and current greater 350 A (today 200 A)
- Certified payment and accounting system
- Only one communication module for AC and DC charging, Powerline Communication (PLC) for DC Charging and advanced services
- State of the art communication via HomePlug GreenPHY enables integration V2H and V2G
One-System Approach

CCS Scope

- Performance up to 350 kW
- DC
- AC
- 350 kW

Added Value
- Extended Functionality
  - Vehicle to grid &
  - Vehicle to home

Worldwide
- Asia
- Europe
- North America

Scope of application
- Motorbike
- Car
- Bus | Truck
Future charging offers flexible mobility

Home

Metropolitan / Highway

Long distance highway

 CCS next level offers more flexibility in mobility

* with consumption of 12.7 kWh/100 km
Standardization – perspectives for CSS
Charging times for about 400 km range

Reduction of charging time by increasing the charging voltage up to 1,000 V and / or of the charging current to 350 A
EV market and ISO15118
ISO/IEC15118 – today’s use-cases

GOAL: One communication solution for all charging needs

- **Simple payment & billing**
  - **Automatic payment** from PEV & other payment methods supported
  - **Secure payment** via state-of-the-art signature & certificate usage

- **Optimized load management**
  - **Cost**- (e.g. night tariff), **renewable**- and **battery-optimized charging** with load-leveling supported
  - **Fleet-charging management** for areas with high density of PEVs (e.g. parking lots, logistics companies, etc.)

- **Additional PEV customer services**
  - Access to **internet-based services** (e.g. diagnostics, etc.) incl. home network integration
  - Not yet specified in detail

- **AC/DC Charging Control**
  - **DC Fast charging** targeted to public infrastructure (e.g. at highway gas stations)
  - **Charge-control** via voltage and current control & status commands

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2017/03/23 Slide 20
EV market and ISO15118
ISO/IEC15118 - future use-cases

- **WPT (Wireless Power Transfer)** for convenient customer experience
- **One wireless communication channel** for fine positioning, pairing and charge control
- **Authentication of off-board charging equipment** via same methods used for AC and DC charging

- **Reverse Power flow** for smart grid support
- **Charge-control** via control & status commands
- **Re-usage of communication technology** for AC & DC & WPT charging (i.e. single interface)

- **Support for electric Busses** for public transport
- **Control of Pantograph** for connect/disconnect
- **Short-time, high Power DC charging** at public bus stations

Additional FOCUS: Wireless communication & extended smart grid support
Basic challenge - customer perspective
Sustainable and easy to use infrastructure are major goals

**Major barriers**
- Charging time for long distance trips
- Missing return of investment
- Incompatible charging infrastructure

**CharIN initiative contribution**
- High power charging
- Long term investment protection
- Up-/Downward compatibility
- One standard for all use cases
- Consistent system (Hard-/Software)
CharIN association
Vision / Mission / Activities
Organisational Structure

On to success with structure

Executive Board

Managing Director & Coordination Office

Steering Committee

Focus Groups

Charging Connection
Charging Communication
Charging Infrastructure
Charging Topology
Interoperability / Conformance Test
Grid Integration

Claas Bracklo
Michael Keller

Manfred Herrmann
Veit Rohrberg
Mathias Böttrich
Axel Willikens
Wolfgang Selle
Gabriele Binasch

Oliver Richter
Helmut Friedrich
Frank Dambacher
Volker Blandow
Martin Freese

Coordination Office CharIN
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Executive Board
- conducts the business of the association
- represents the association

Steering Committee
- determines and advises the Executive Board
- decision about membership
- advises and monitors the Focus Groups

Coordination Office
- General support
- Meeting Management
- Membership administration

Focus Groups
- Tech work
CharIN e.V.
Accessible at any time round the world

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CharIN e.V. - CCS contribution

Our Members

Core Members

Regular Members

Associated members

The CCS community and outcomes are steadily growing

⇒ Currently 78 members

Members in alphabetical order. Founding Members highlighted in "green".

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Membership Share

Top 20 brands 2016 by volume

15 of the top 20 brands are represented in CharIN
Summary

- Fragmented market → consolidation foreseeable.
- Significant technology advantages of the integrated system approach CCS
- Authority support and OEM commitment in the US and Europe
- Continuous optimization of the customer experience
- Open standards make participation and co-designing possible
- CharIN is a neutral and central contact point platform [www.charinev.org](http://www.charinev.org)
- Global system approach and global presence
- Industrial focus and major contributors along the value chain
Thank you for your kind attention!

Are there any further questions?