DOCKETED

Docket Number:	17-IEPR-07
Project Title:	Integrated Resource Planning
TN #:	221485
Document Title:	Presentation - The Path to a Global Charging Standard
Description:	Presentation from Charin regarding the benefits of electric vehicle charging stations.
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Organization:	Charin
Submitter Role:	Public
Submission Date:	10/12/2017 4:26:08 PM
Docketed Date:	10/12/2017

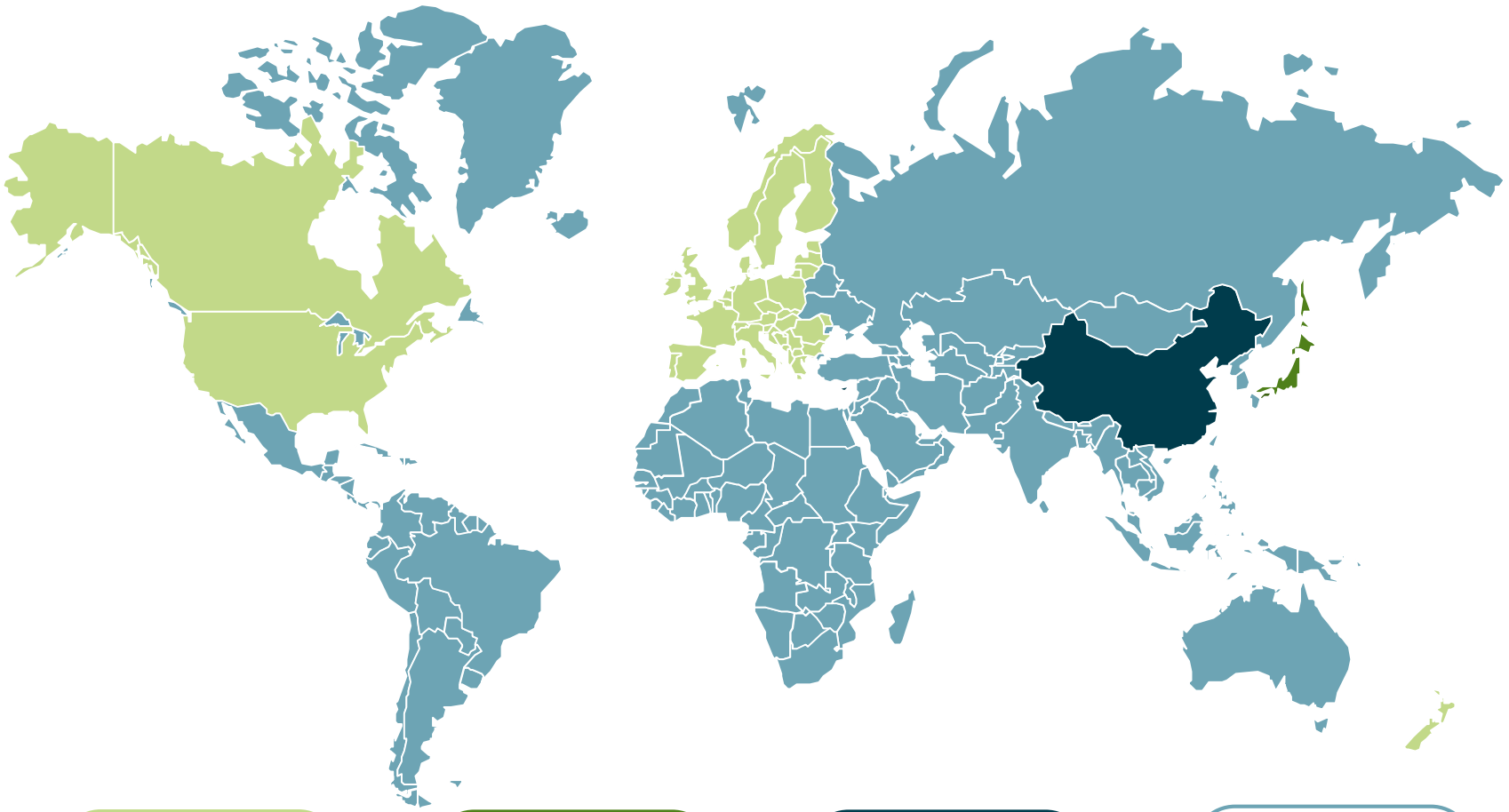
CharIN e.V.
The path to a global charging standard

Coordination Office CharIN
c/o innos - Sperlich GmbH

2017/03/23

World Map of Charging System Standards

CHARIN



CCS

CHAdeMO

GBT

Not decided

Overview of Charging Systems

	Europe CCS (AC & DC)		USA CCS (AC & DC)		Japan CCS (AC)/CHAdeMO (DC)		China China GB	
AC								
DC								

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

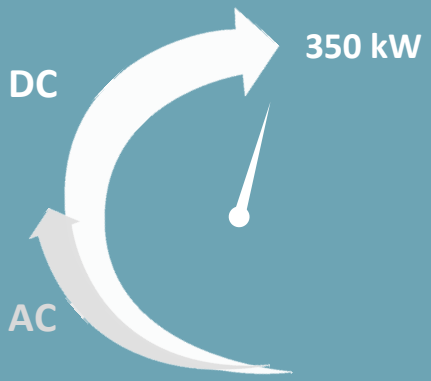
- Integrated electrical architecture for all relevant AC and DC charging scenarios
- One inlet and one charging architecture for DC and AC
  ➔ low overall system costs
- Electrical lock mechanism in vehicle inlet
- PLC communication
- 100% SOC in one charging process possible - Charging supervision can 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

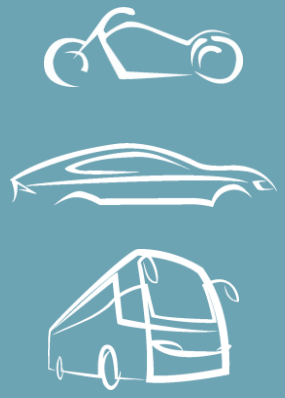


Added Value

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

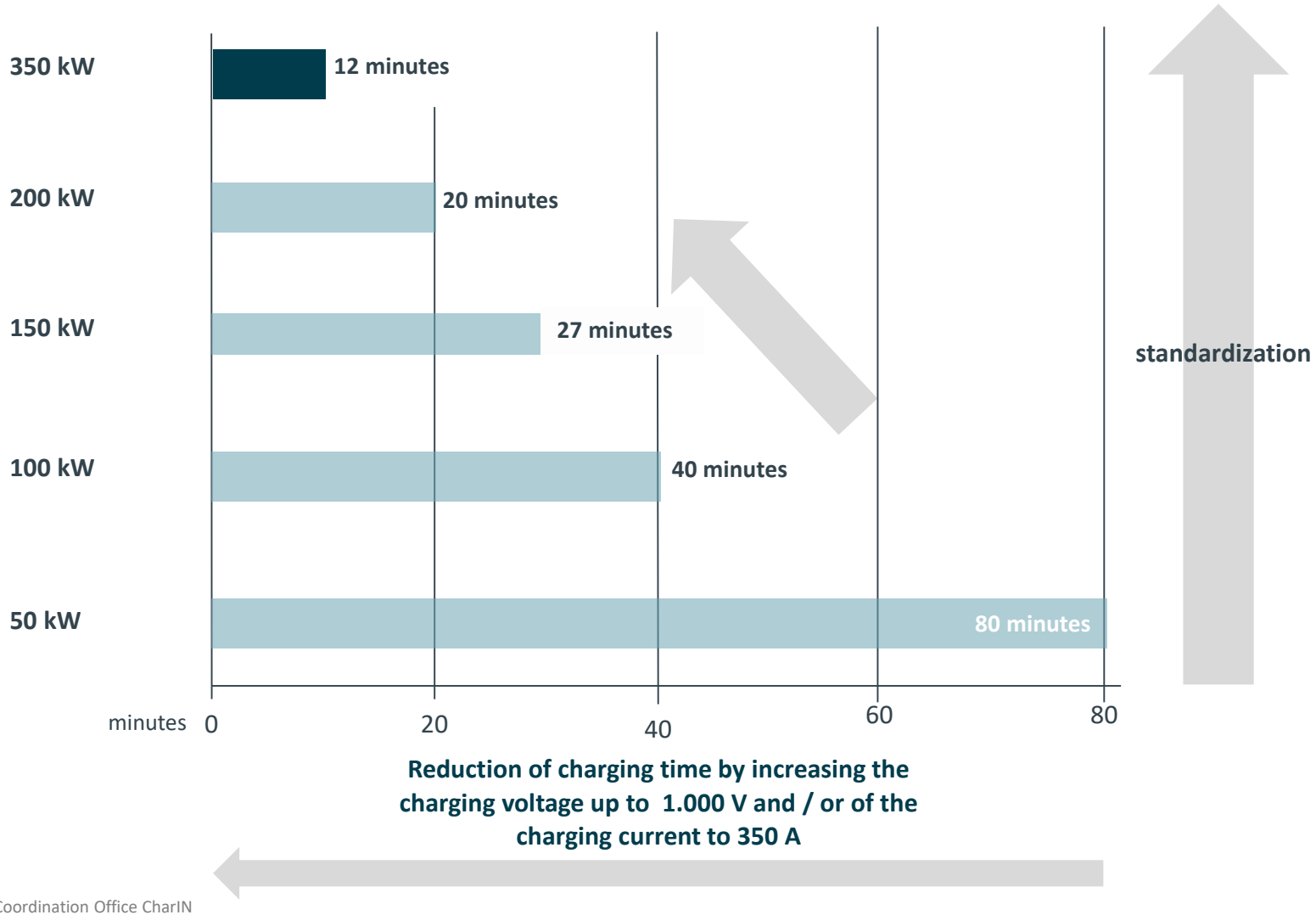
min/100 km	~ 21 min*	<10 min*	<4 min*
	50 kW	150 kW	350 kW

* with consumption of 12,7 kWh/100 km

CCS next level offers more flexibility in mobility

Standardization – perspectives for CSS

Charging times for about 400 km range



EV market and ISO15118

ISO/IEC15118 – todays use-cases

Vehicle to Grid communication

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-levelling 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

GOAL: One communication solution for all charging needs

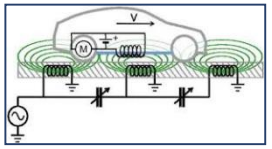
EV market and ISO15118

ISO/IEC15118 - future use-cases

Vehicle to Grid communication

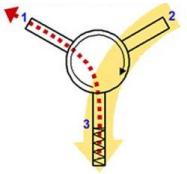
WPT-charging control

- **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

- **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)



Automated Connecting Device

- **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

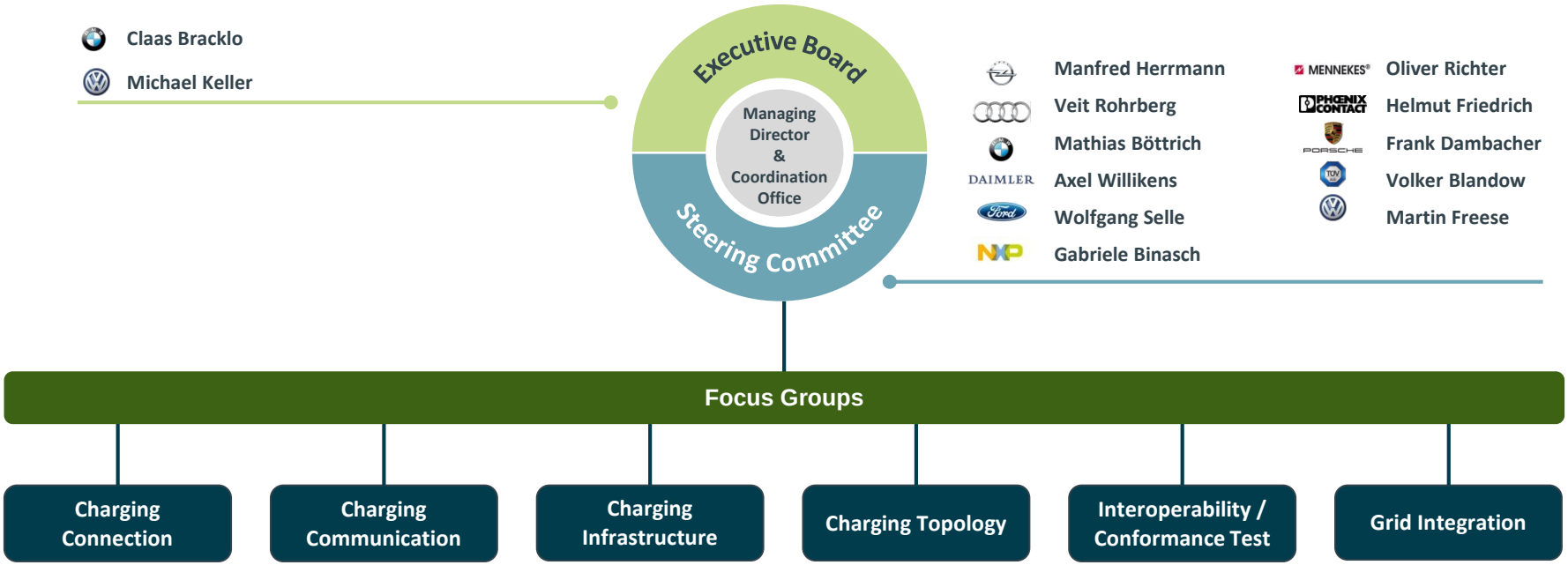
Major barriers		CharIN initiative contribution
Charging time for long distance trips		High power charging
Missing return of investment		Long term invest protection; Up-/Downward compatibility
Incompatible charging infrastructure		One standard for all use cases; Consistent system (Hard-/Software)

CharIN association

Vision / Mission / Activities

Organisational Structure

On to success with structure



Organisational Structure - Circle

Executive Board

- conducts the business of the association
- represents the association

Steering Committee

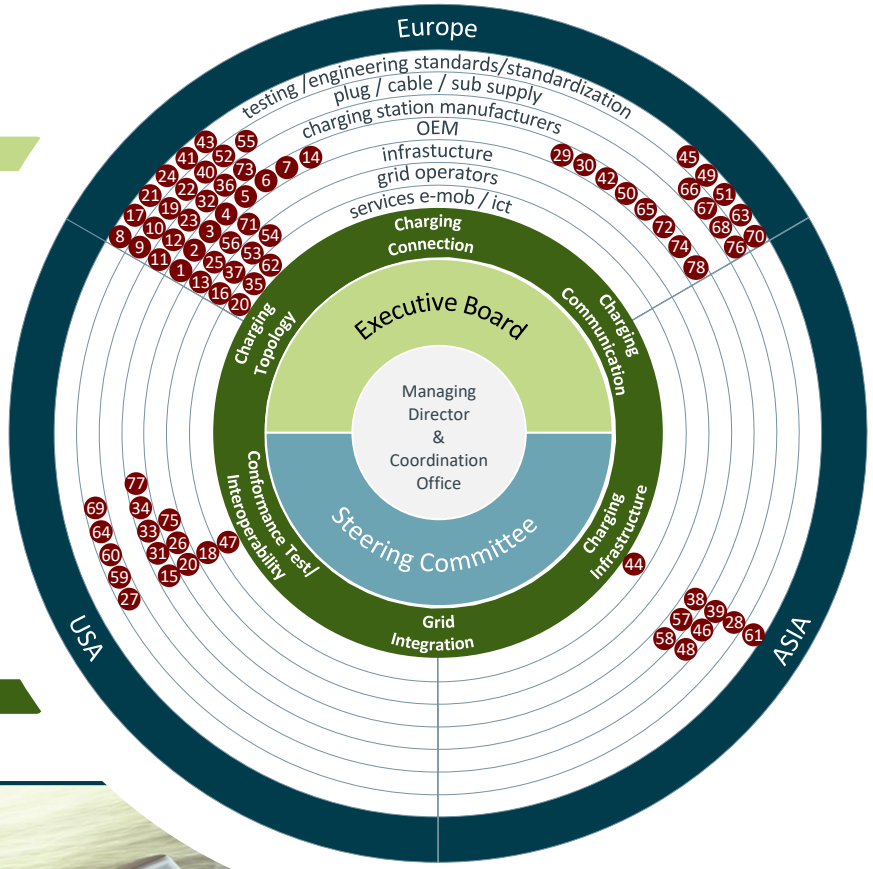
- determines and advises the Executive Board
- decision about membership
- advises and monitors the Focus Groups

Coordination Office

- General support
- Meeting Management
- Membership administration

Focus Groups

- Tech work



1 Audi
2 BMW
3 DAIMLER
4 PORSCHE
5 Volkswagen
6 Ford
7 Opel
8 TÜV SÜD
9 MENNEKES
10 PHOENIX CONTACT

11 ABB
12 efacec
13 FASTNED
14 VOLVO
15 TESLA
16 Power Innovation
17 VECTOR
18 chargepoint
19 HUBER+SUHNER
20 RECARGO
21 VEDECOM
22 NXP
23 DBT
24 voltaVision
25 allego
26 nrg EVgo
27 Cannon ITT
28 JAE
29 GROUPE RENAULT
30 CLEVER
31 Fortescue Future Industries
32 LAPON TECHNOLOGIES
33 LUCID
34 FCA
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36 CIRCONTROL
37 EWE
38 Mahindra ELECTRIC
39 DELTA
40 Continental
41 scienlab
42 PSA GROUPE
43 CARMEQ
44 Gridwiz
45 ies SYNERGY
46 ZHIDA
47 IoTecha
48 TRITIUM
49 Applus IDIADA
50 JAGUAR LAND ROVER
51 comemso
52 STMicroelectronics
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55 YAZAKI
56 SIEMENS
57 HONDA
58 HYUNDAI
59 Infineon
60 LEAR CORPORATION
61 KERI
62 ENERCON ENERGY FOR THE WORLD
63 iav automotive engineering
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65 MAHLE
66 RENESAS
67 BOSCH
68 EBV Elektronik
69 Intel
70 tu technische universität dortmund
71 Shell Global Solutions
72 TOYOTA
73 EVTRONIC
74 National Electric Vehicle Sweden NEVS
75 BTCPOWER
76 ROHM SEMICONDUCTOR
77 PROTERRA
78 ENERGICA

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CharIN e.V. - CCS contribution

Our Members

Core Members

Regular Members

Associated members

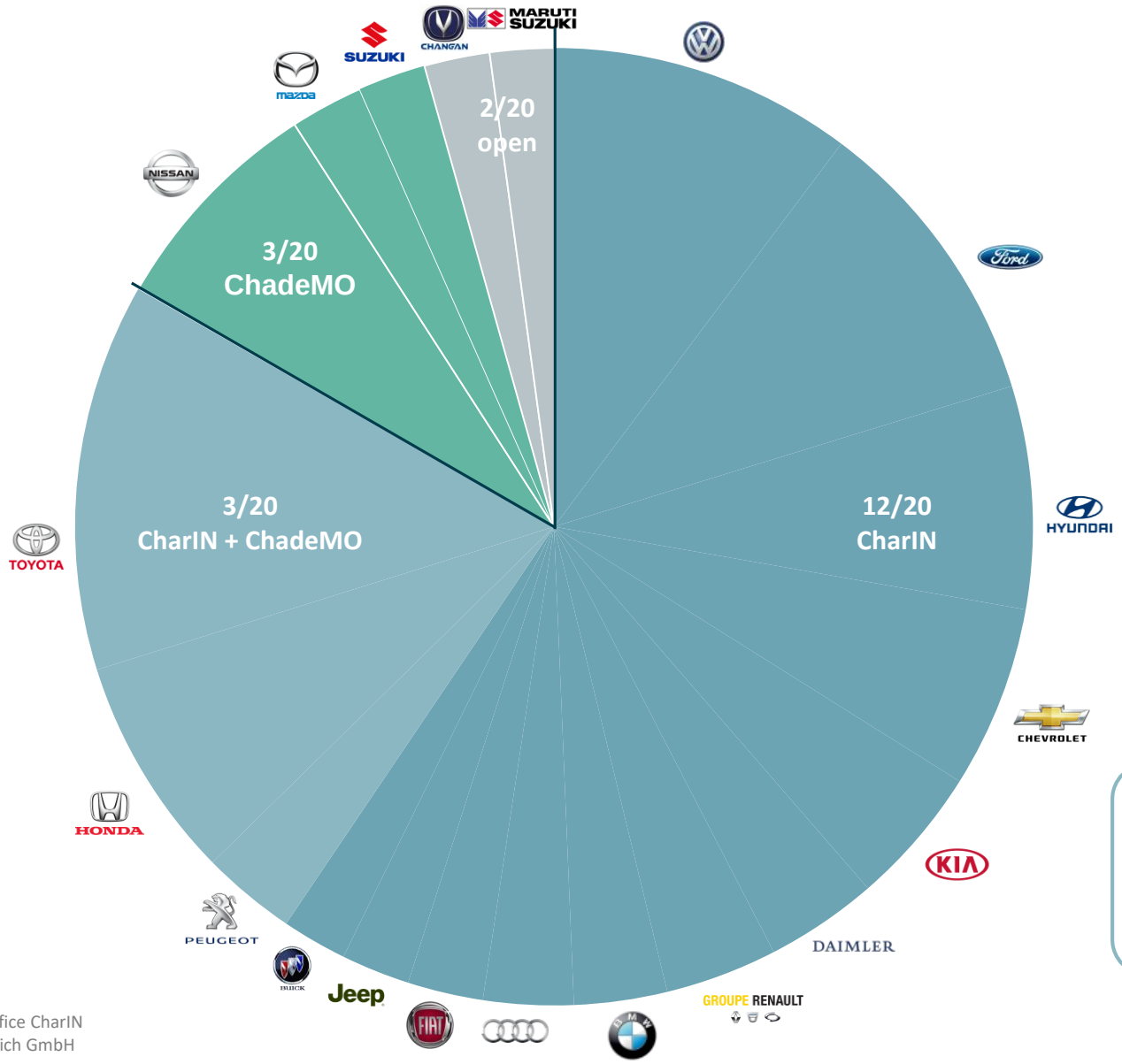
The CCS community and outcomes are steadily growing

⇒ **Currently 78 members**

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

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** ✓
- Global system approach and global presence ✓
- industrial focus and major contributors along the value chain ✓

Impressions

CHARIN

Thank you for your kind attention!

Are there any further questions?