Fabian Hess – ABB Product Group EV Charging Infrastructure
Tokyo - Oct 6, 2011

DC Fast Charging Infrastructure
An update from ABB perspective

Power and productivity for a better world™

EV Charging Infrastructure
New Product Group in ABB

Headquarters, Rijswijk, the Netherlands

Software development center at high-tech campus, Eindhoven, the Netherlands

- Global leader in power and automation technologies
- 124,000 employees in about 100 countries
- Formed in 1988 merger of Swiss and Swedish engineering companies.Predecessors founded in 1883 (Asea) and 1891 (Brown Boveri)
- Dedicated Product Group located in Rijswijk (HQ) and Eindhoven (Software development center), The Netherlands
- In 2011, ABB strengthened it's EV charging activities by aquiring Epyon B.V.
- Epyon (60+ FTE) was an early leader in DC fast charging infrastructure
- 6-years experience and core expertise in DC fast charging of Li-Ion batteries
- Commercial products in the field since May 2010

EV Charging Infrastructure
Product portfolio overview

Terra DC Fast Chargers

Webconnected intelligent DC fast charging systems

Galaxy management tools

Webbased management tools for site management, statistics and configuration

Houston API Suites

Professional backoffice integration interfaces

Terra Charge Clusters

Turnkey charging solutions for both AC and DC configured to your needs

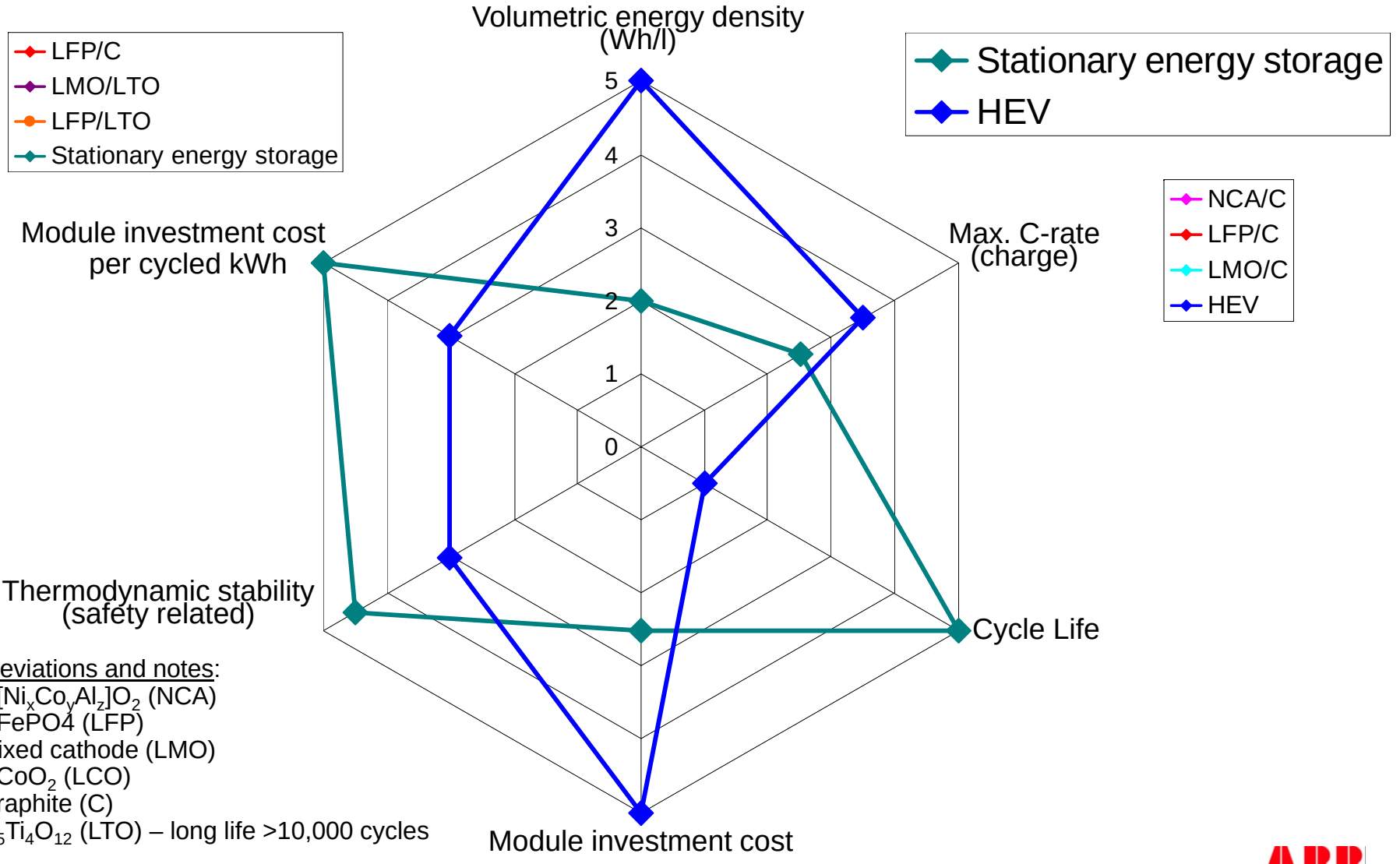
EV Charging Infrastructure Solutions from ABB
References worldwide

EV Charging Infrastructure Solutions from ABB
Proven technology in the field since early 2010

Reference deployments in

Germany, The Netherlands, UK, Ireland, Finland, Denmark, Sweden, Norway, Switzerland, France, Czech Republic, Italy, China, Taiwan

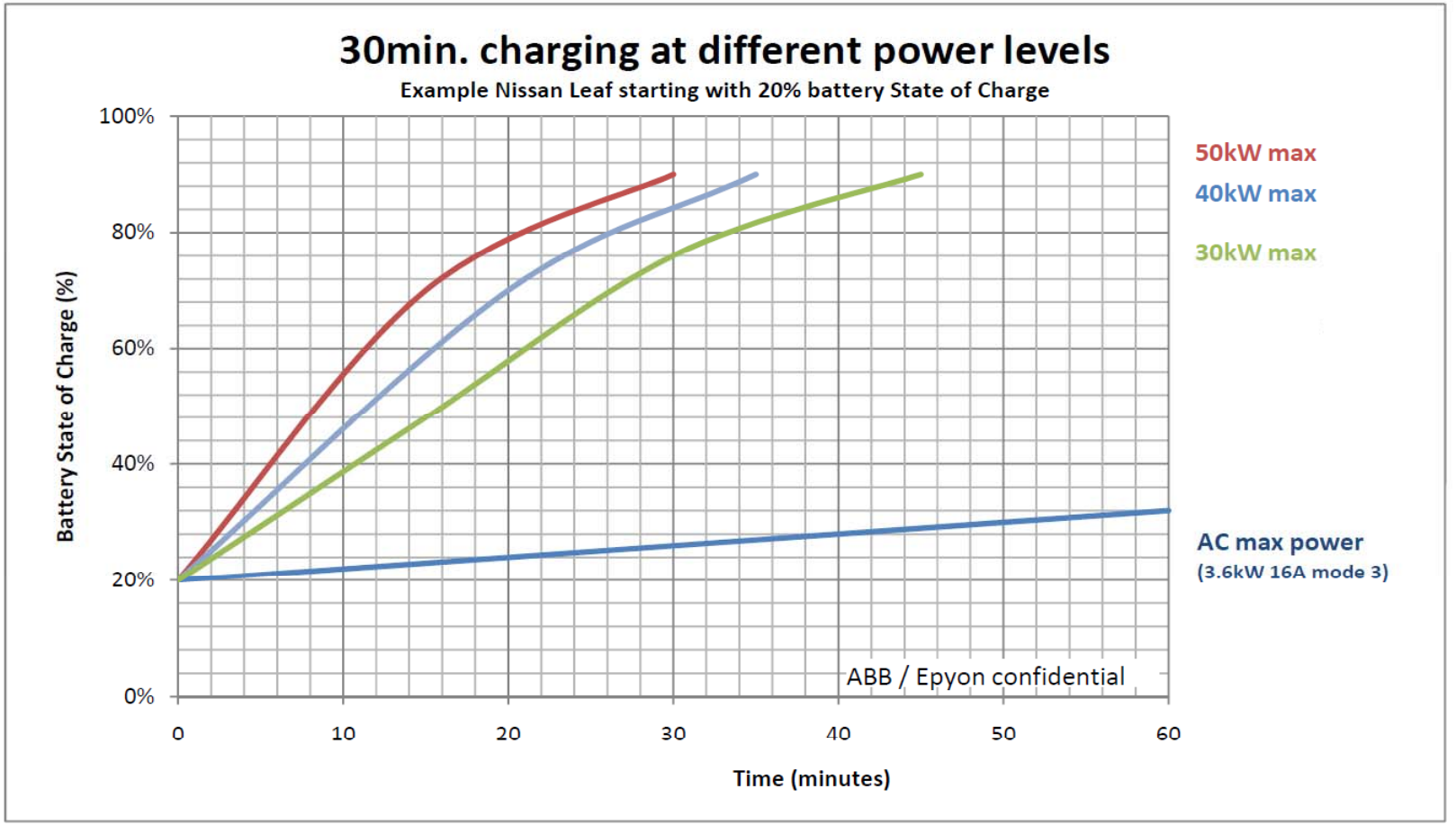
Lithium-Ion Battery Technology Assessment
Selecting suitable materials for Electric Vehicles



Abbreviations and notes:

- $Li[Ni_xCo_yAl_z]O_2$ (NCA)
- $LiFePO4$ (LFP)
- Mixed cathode (LMO)
- $LiCoO_2$ (LCO)
- Graphite (C)
- $Li_5Ti_4O_{12}$ (LTO) – long life >10,000 cycles

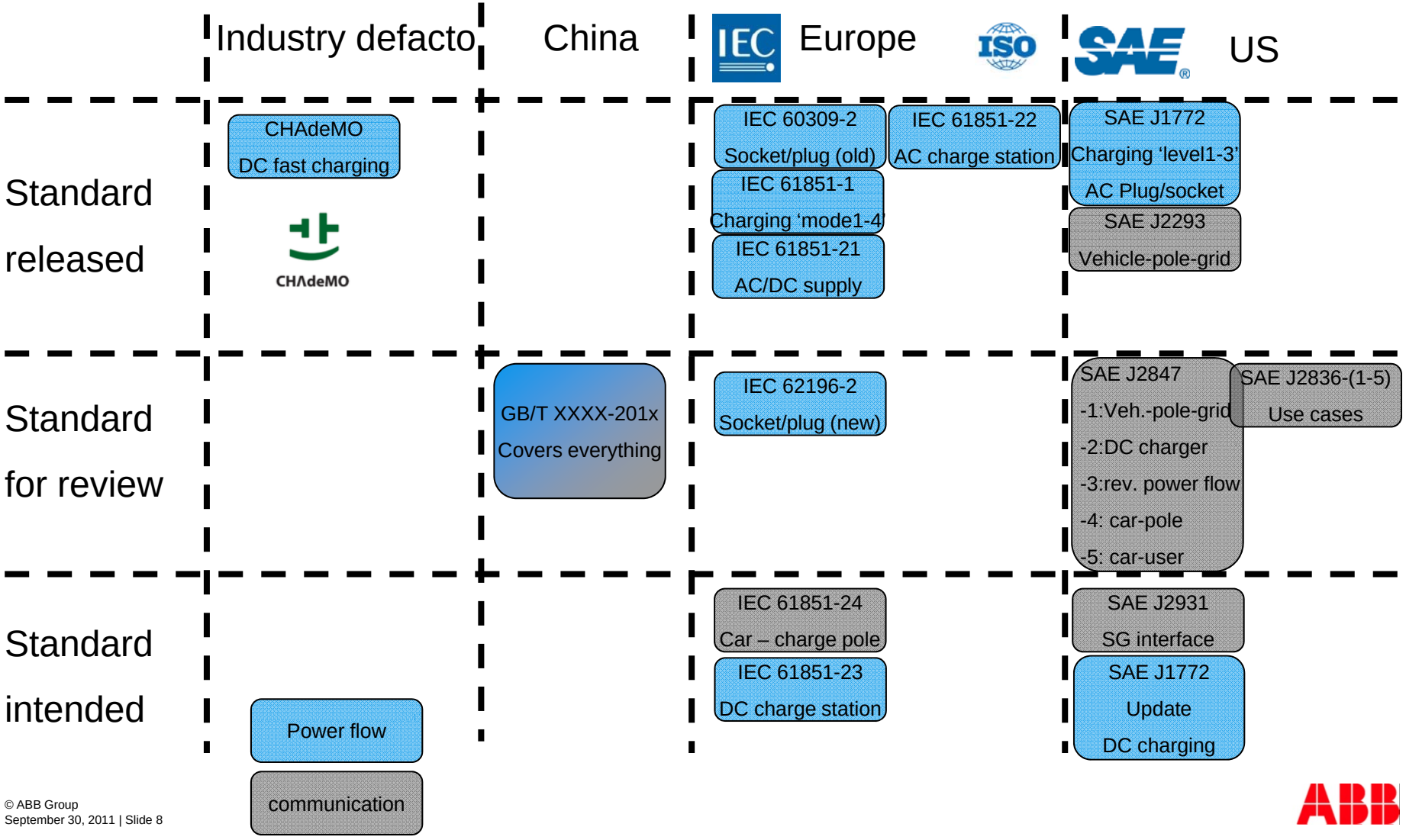
Lithium-Ion Battery Technology Assessment
30-50 kW example with Nissan Leaf



Core expertise and database with over 2 billion measurements based on 6 years of research in ABB labs with many different li-ion batteries

The Standardization Landscape

One objective: safe, simple, affordable, effective, global



The Business Model Landscape
Billing & Payment

Network membership models (RFiD smart card)

- Flat-fee (€ x / month)
- Flat-fee + fee per session

Online / Telco models (various models)

- Flat-fee (€ x / month)
- Pay per use
- Pay via sms, smartphone, apps

Direct payment systems/local payment models

- Pay per use
- Free of charge if you buy coffee/lunch
- Credit-card or pay in shop

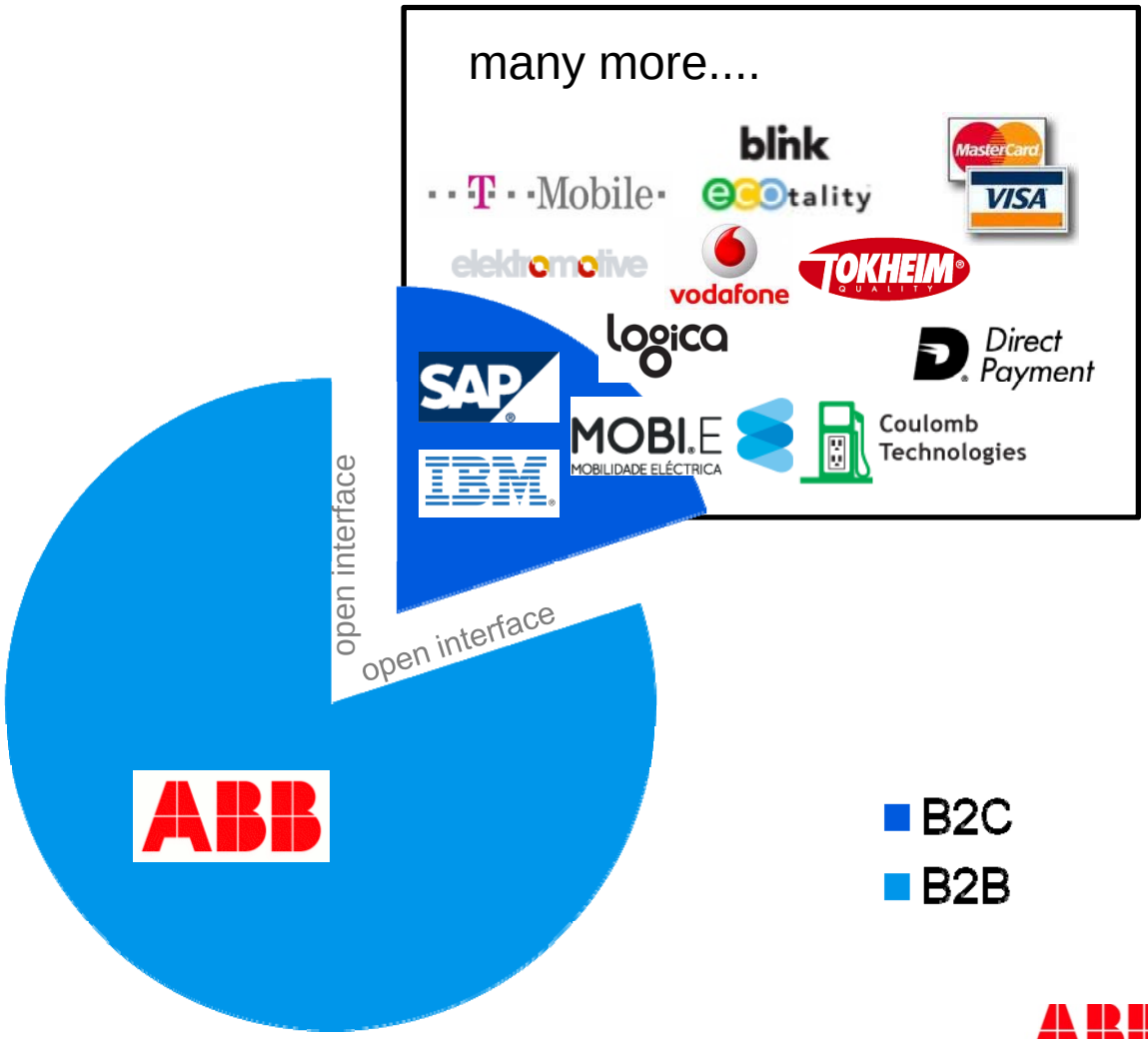
None of the models seem to focus on payment per kWh only!
Time-based or session-based fees are the standard

Different Payment Models will be implemented

Reduce complexity with standards and open interfaces

Main priorities:

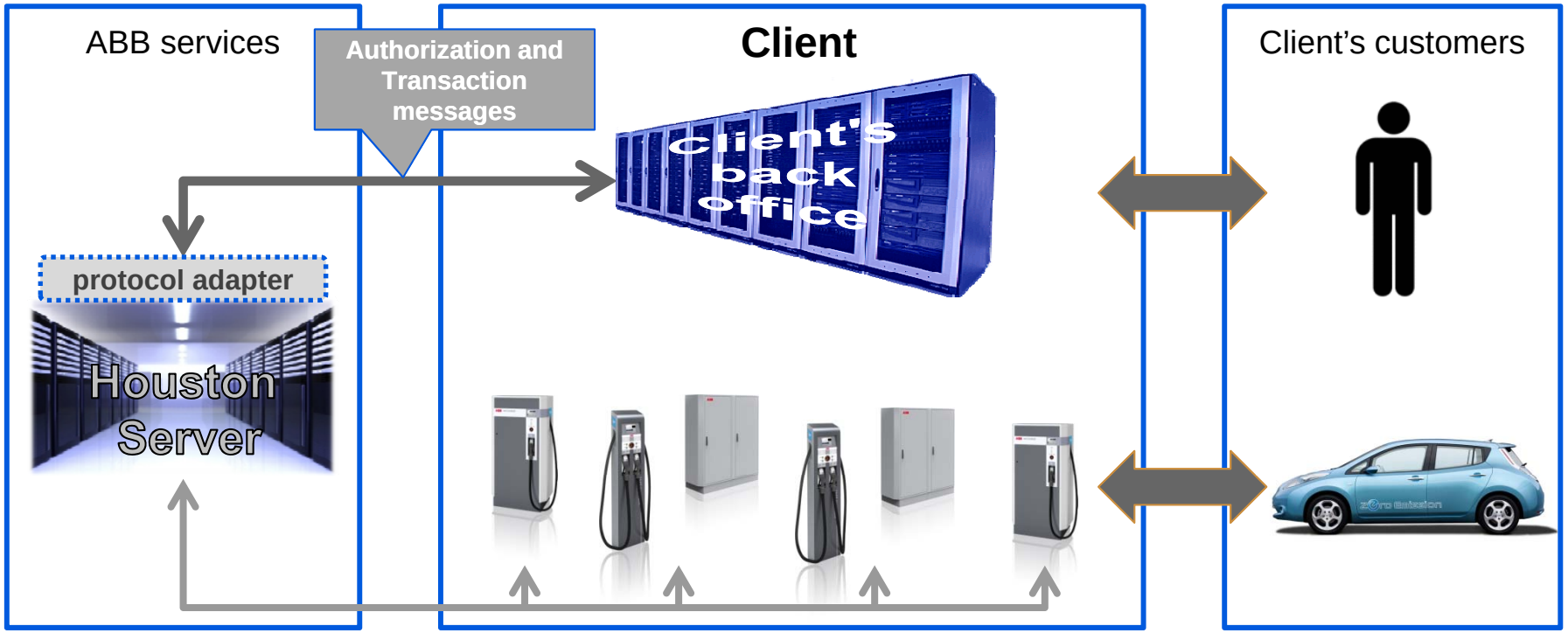
- Create standardized interfaces short-term
- Interoperability
- Based on open protocols
- Vendor independent, no lock-in mechanisms
- No license fees
- Not too complicated (long integration projects)



Open Charge Point Protocol (OCPP)
Open back-office integration protocol for EV chargers

- OCPP is an back-office integration protocol specifically designed for EV chargers
- OCCP was developed in 2009-2010, proven and robust technology
- OCPP is quickly becoming a standard for EV charger back-office integration
- OCPP is an open protocol, no licence fees are required
- More information can be found at: http://www.ocpp.nl/
- Specification is managed by steering group including utilities & charger makers
- OCPP is supported by utilities, charger makers and network operators from Germany, Scandinavia, UK, Ireland, and The Netherlands

Back-office Integration
API for authorization and transaction support



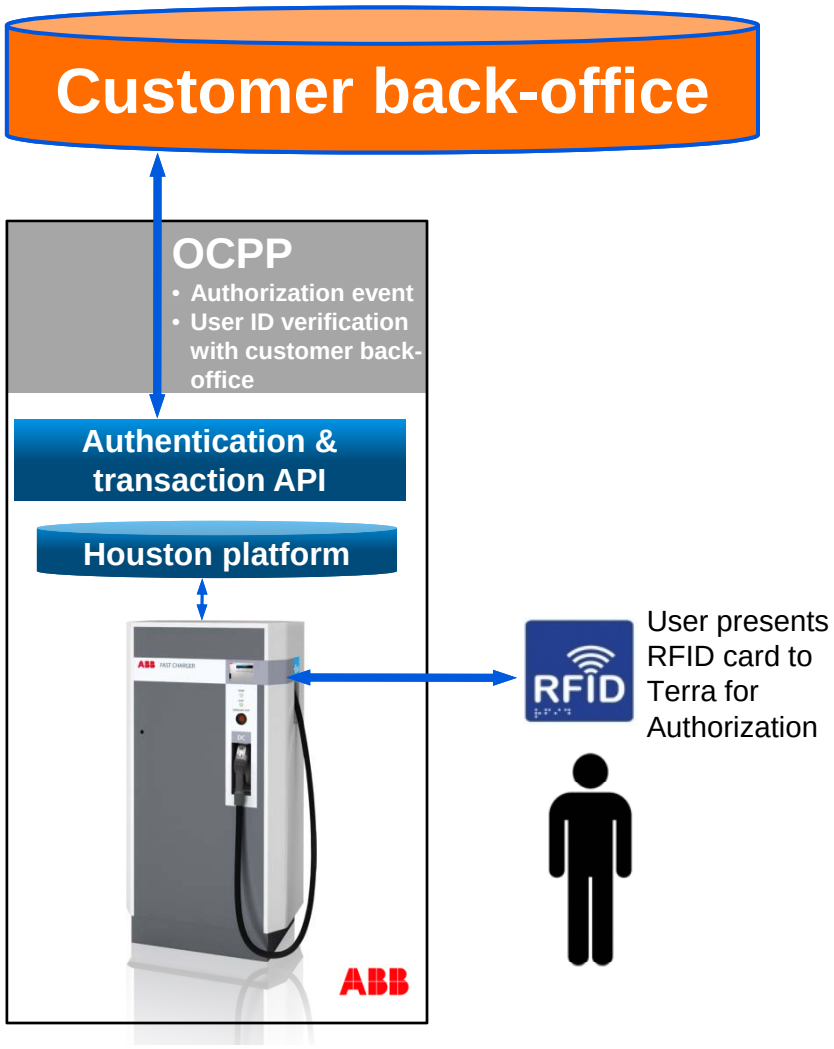
The authorization and transaction support APIs connect the chargers to the customer's subscriber management solution and back-office

Back-office Integration
Method 1: Cloud authorization via OCPP

Any other subscriber management or payment mechanism at the customer side

- Cloud authorization can simply be achieved via the Remote Start & Remote Stop functionality in OCPP
- Enabling a multitude of authorisation mechanisms such as SMS, phone, Apps, smartphones, etc.
- At the “start” and “stop” of the session the session data (kWh, details) is sent to the customer backoffice

Back-office Integration
Method 2: Use the built-in RFiD reader with OCPP



- Authorisation via an RFiD smart card can be achieved via the Authorisation functionality in OCPP
- The charger ask for verification of the presented user-ID with the customers back-office system
- At the beginning and end of the charge session the session data (kWh, details) is sent to the customer backoffice

ABB Software Services Platform
Connectivity of the Terra chargers

Galaxy

1. Equipment owner or operator

2. End user of the equipment
(vehicle driver)

3. Entities impacted by operating the equipment
(Utilities and Grid operators)

4. Entities which could be impacted / have benefits of the equipment
(Retailers, Spot market traders, ..)

Houston

Terra

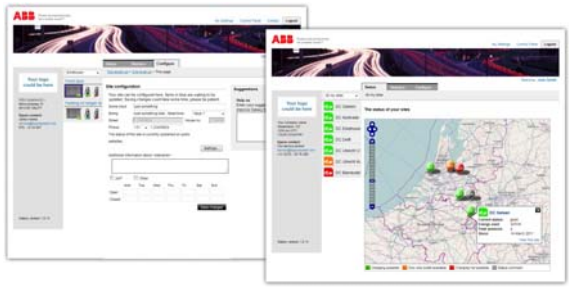
Helios

1. The ABB Network Operations Center for monitoring, remote assistance and remote management

2. Local Service fulfillment

Commissioning
1st, 2nd and 3rd line Support
Maintenance & Repair
Performance reports

3. ABB Research

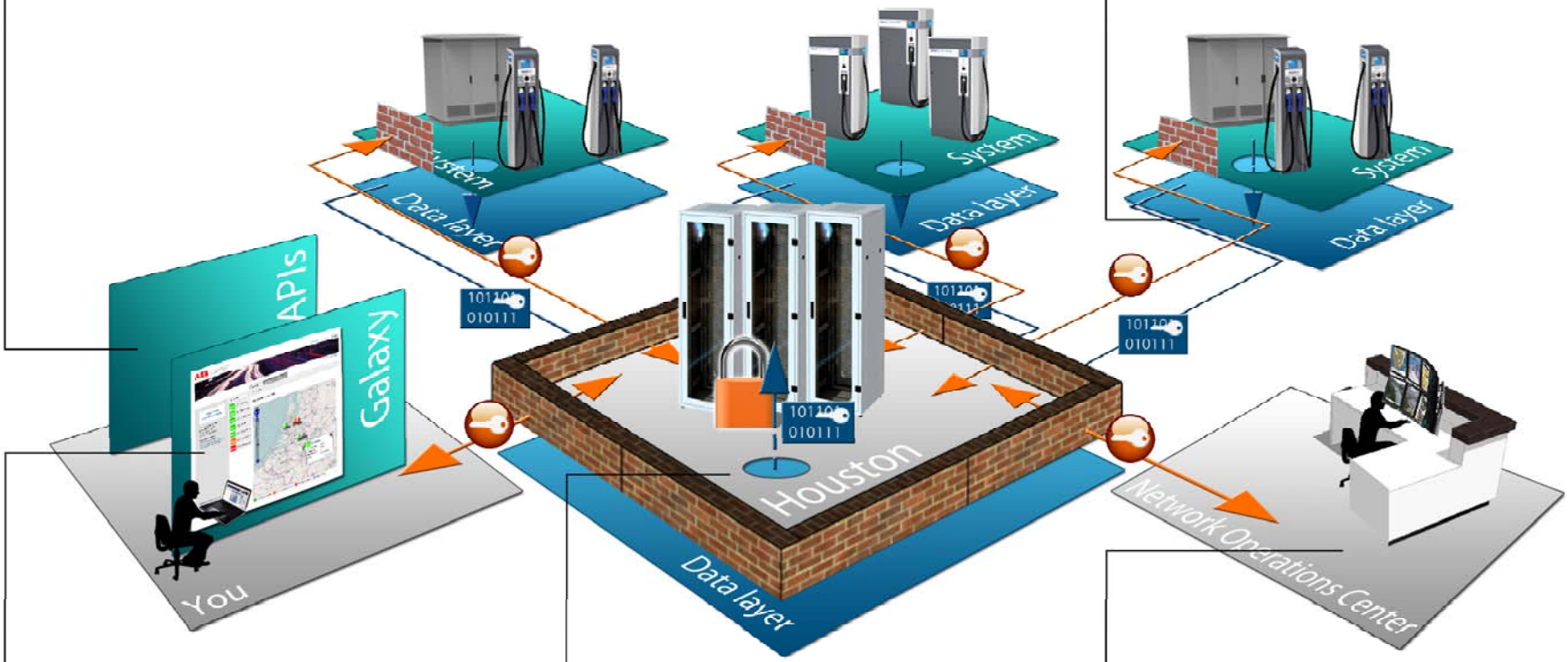


Network Operations Center (NOC)

Data Architecture
Designed for reliability and security

Houston APIs
Your data can be accessed via a Houston API, a reliable server-to-server interface which enables you to connect your own back office or user administration system directly to your charging network.

Data transportation
Your charger data, settings and software updates are transported via a secure connection. ABB uses TLS and X509 certificates, a security standard widely used to protect classified industrial and governmental information.



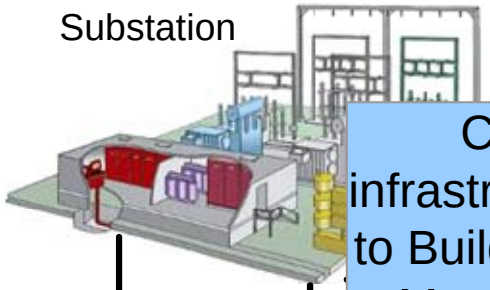
Galaxy
Via your Galaxy web interface you have the ability see real time status, charger usage and energy delivered of your sites and configure the chargers at your sites. Galaxy utilises a secure HTTPS connection to access your data.

Houston server
Your data is professionally stored at an independent third party data center, utilising strict security standards and professional backup systems. Software updates go via Houston, separated from your data. ABB cannot access your raw data.

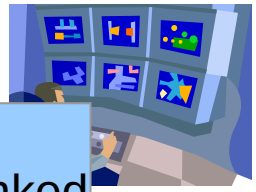
ABB Network Operations Center
The ABB Network Operations Center (NOC) is always stand-by to provide online support and field service assistance. The NOC will keep your software updated and helps you to improve the performance of your operation.

Integrated EV Charging Infrastructure Solution
A system with many ABB touch-points

Renewable energy sources



Substation



Network mngt, authentication & billing

Charging infrastructure linked to Building-Energy-Mgmt-Systems

Battery swap stations for public transportation

Energy storage & power quality

Public DC charging station 50 - 300 kW

Public AC charging pole 3-20kW

Domestic AC wallbox 3 - 4 kW

Bidirectional (dis)charging, Grid support (V2G)

Used car batteries as central storage capacity

Open Issues and Concerns
The path to vehicle electrification: collaboration

- **CHAdeMO 1.0. draft spec:**
  Backward/forward compatibility of 1.0/0.9 EV with 0.9/1.0 QC?
→ final 1.0 spec to include mandatory compatibility with 0.9
→ all 1.0 vehicles need to be chargeable with 0.9 chargers

- **CHAdeMO certification:**
  'Official' CHAdeMO certification vs. mandatory EV-specific certification?
→ unambiguous certification by independent notified body preferred
→ ABB is looking into possibilities for EU and US based external certification bodies

- **Ambitious forward-looking volume & price announcements for QC:**
  Ability to execute? Product maturity & functionality?
→ risk of stalling the market with a non-fulfillable promise
→ manage market expectations with integrity and credibility

- **Common goal & moving forward together:**
→ ABB is looking into possibilities to actively participate in future work: e.g. governance, bi-directional, grid impact/control (SEP2.0), eco station (PV, Storage)

ABB is driving the transformation toward sustainable mobility
with a complete infrastructure solution and service portfolio for EV charging

Power and productivity
for a better world™